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Heating and Ventilating

For Engineers and Contractors Controlling the Design, Specification, Installation and Maintenance of Heating, Ventilating and Air Conditioning

Volume 31 APRIL, 1934 Number 4

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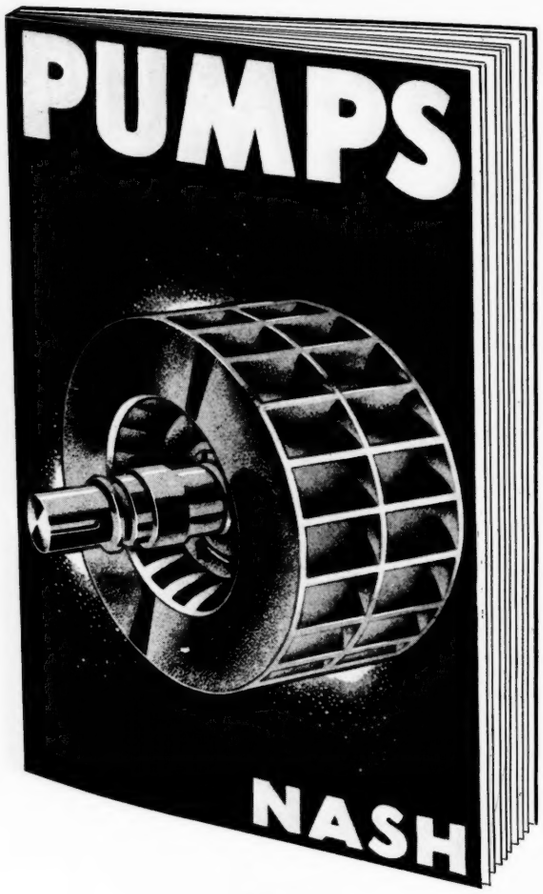

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How Accurate Are Humidity Calculations?

By N. R. SPARKS†

In using charts giving air properties we commonly assume that they are accurate. As a matter of fact they are not. The study reported here checks up to find the amount and to isolate the cause and judge the seriousness of the errors. Close agreement between the calculated values in common use and those found directly by trial indicates that these errors are not serious in ordinary calculations in air conditioning. With small wet bulb depressions (high relative humidities) the error is least and increases as the depression becomes greater. The author points out that this may be due to assumptions in calculating which are not fully justified.—Editor

THE ordinary method used for the quantitative determination of water vapor in air is based upon wet bulb and dry bulb temperatures and barometric or total absolute pressure as the observed data. The vapor pressure is found from these data by the use of some standard formula, usually either Ferrel's or Carrier's in connection with steam tables. Absolute or relative humidity is then calculated, using perfect gas laws for both air and water vapor.

It is not easy to determine the exactness of the results obtained by this method. That the results are in error is probable for three reasons. First, the existing psychrometric formulas are not uniformly accurate over varying ranges of barometric pressure, dry bulb temperature, and wet bulb depression. Second, perfect gas relationships are not strictly applicable in the calculations, although this refers more to their use with water vapor than with air where the error at ordinary temperatures and pressures is negligible. Third, the method of observing the wet bulb temperature may be a source of inaccuracy.

For the purpose of determining the error in the

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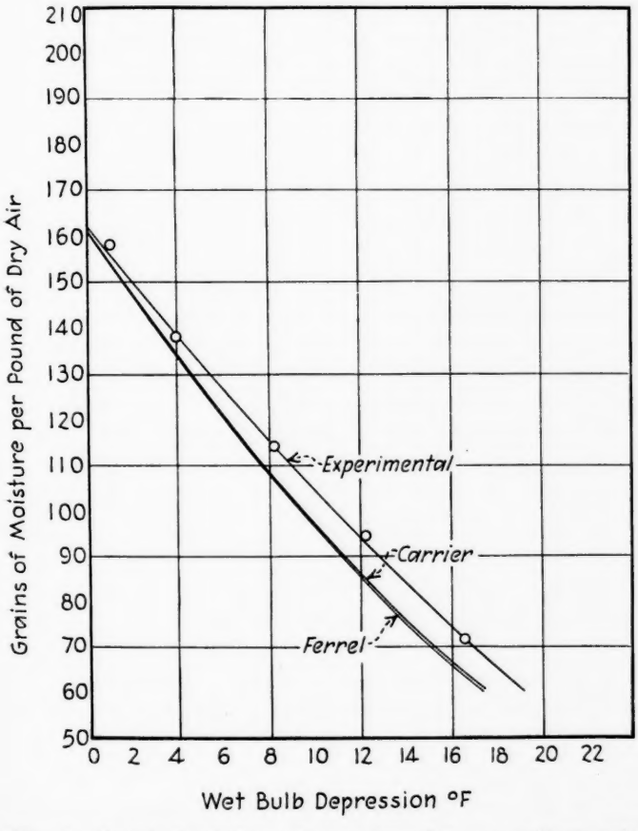


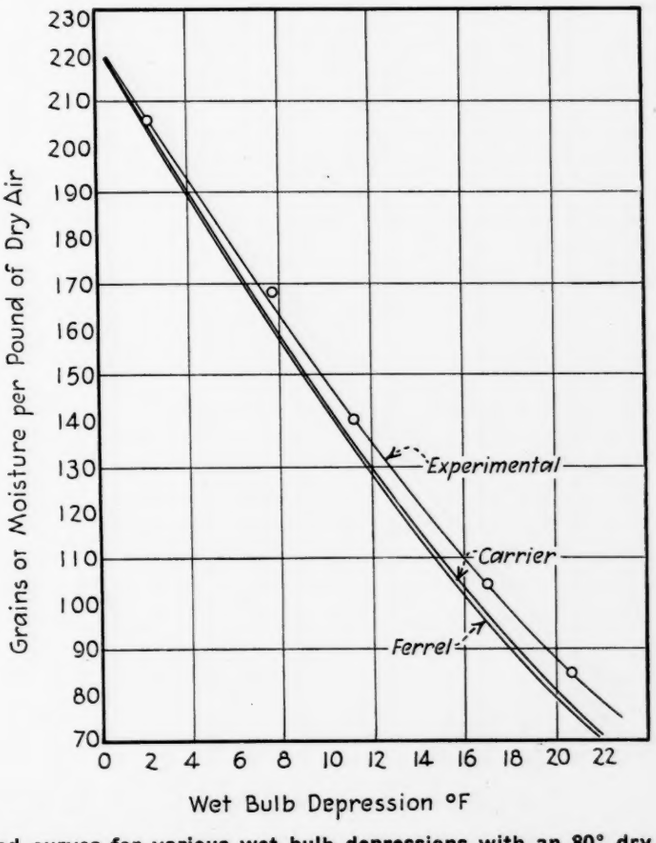
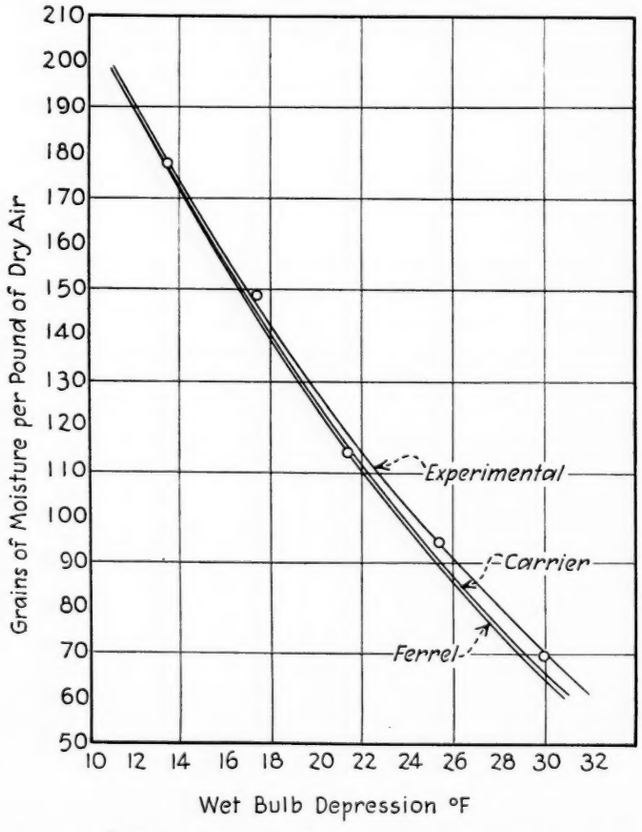


Fig. 1. (Left) Deviation of experimental curve from calculated curves for various wet bulb depressions with an 80° dry bulb. Fig. 2. (Right) Deviation of experimental curve from calculated curves for various wet bulb depressions with a 90° dry bulb

above-mentioned method by experiment, two graduate students in the Department of Mechanical Engineering at The Pennsylvania State College, W. P. Henszey and L. E. Williams, recently undertook the project as a thesis. The curves here reproduced are from this work.

For the sake of comparison, the plan was simply to take wet and dry bulb temperatures and the absolute pressure of air in a duct and, at the same time, to withdraw samples for direct analysis. In this way, humidities could be both calculated and found experimentally for air under identical conditions. For the calculated humidities, both Ferrel's and Carrier's equations were used in computing vapor pressures. A unit conditioner supplied air, regulated to approximately the desired temperature and humidity, through a duct from which the samples were drawn and in which the wet and dry bulb temperatures and the pressure were taken. In order to reduce to a minimum the errors in observation of temperatures, thereby eliminating in so far as possible the source of error mentioned above as the third, great care was taken in the construction of the temperature devices. Copper-constantan thermocouples were used for both the wet and the dry bulb temperatures, the readings taken from a sensitive potentiometer in millivolts and translated to degrees Fahrenheit. These couples were mounted in a separate flue lined with aluminum foil to reduce radiation and having an air velocity sufficient for a reliable wet bulb reading. This apparatus was carefully checked against sensitive mercury thermometers in the same location before being relied upon for test readings.

The apparatus, which was finally developed after a considerable period of experimentation, consisted essentially of a glass air receiver with inverted graduated neck, calibrated, and water-jacketed for steadiness of temperature. The capacity of the receiver ranged from 3145 cc. to 3195 cc. Air was drawn into the receiver from the duct through the drying tubes, the aspirating effect being produced by filling the receiver with oil and draining. The oil used for this purpose was nonvolatile so as to produce no noticeable vapor pressure. Means were provided for equalizing the receiver to atmospheric pressure after the sample was secured. Two U-tubes in series were used as dryers, one being filled with activated alumina, the other with phosphorus pentoxide as the dehydrating agents. The gain in weight of these tubes after the passage of a number of samples of air of known quantity provided the basis for the calculation of the moisture per pound of dry air. Extreme care was necessary in handling and weighing the drying tubes, a technique finally being developed which made possible their manipulation without affecting their weight. Chemical balances readable to one one-thousandth (0.001) gram were used for weighing, but it was deemed advisable to accumulate the moisture from several samples before the final weighing in order to reduce the possibility of error. The rate of air flow through the drying tubes was approximately 160 cc. per min., kept at that low figure in order to allow sufficient time for the absorption of moisture. In almost all cases, all the moisture was removed by the first tube, the second being used as a check for dryness and showing no gain in weight. The apparatus as a whole is shown in Fig. 5.



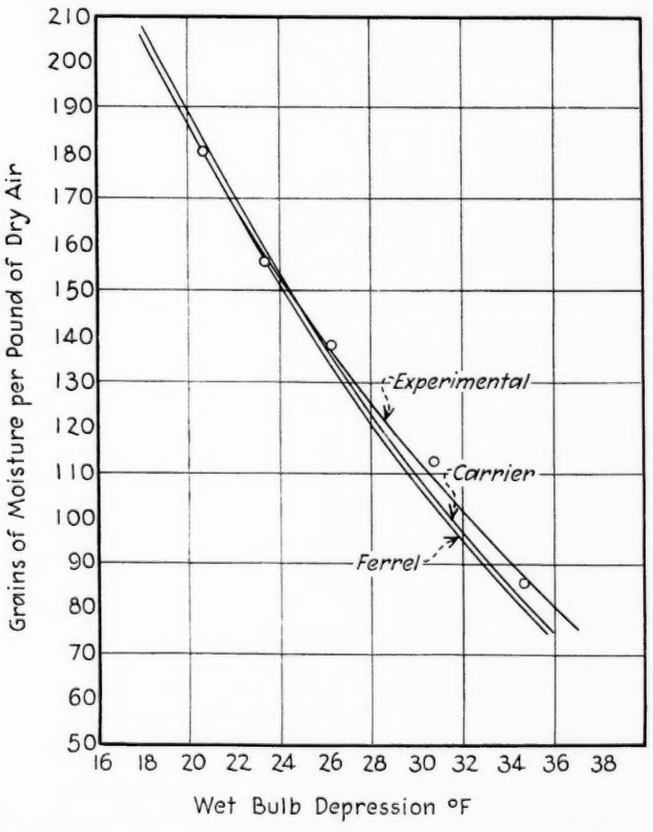


Fig. 3. (Left) Deviation of experimental curve from calculated curves from various wet bulb depressions with a 100° dry bulb. Fig. 4. (Right) Deviation of experimental curve from calculated curves for various wet bulb depressions with a 110° dry bulb

Results are shown in curves instead of giving the entire data. Figs. 1, 2, 3, and 4 show grains of moisture per pound of dry air at temperatures of 80°, 90°, 100°, and 110°, respectively, for varying wet bulb depressions, as determined by experiment and by calculation from Carrier's and from Ferrel's vapor pressure equations.

Analysis of the curves shows that the error in calculated humidities is greatest with lower air temperatures and also that the error increases with increasing wet bulb depression at a given air temperature. In general, the humidities calculated from Carrier's vapor pressure equation are more nearly correct than those from Ferrel's, but the two are in close agreement. Either equation probably gives the vapor pressure within a negligible error, the deviations occurring at temperatures above the dewpoint being due rather to the method of calculation of humidity for all but air saturated with moisture. In this calculation, reliance is placed upon perfect gas laws as applying to the superheated water vapor. To this, rather than to the equations, a large amount of the error may be traced, as is shown by the fact that at the dewpoint, where these assumptions are unnecessary, the calculated humidities are in agreement with those experimentally determined. This leaves as the principal source of error that mentioned above as the second, namely, the assumption of perfect gas characteristics for water vapor.

Deviations of the calculated from the experimental humidities, being greater at lower air temperatures and at larger wet bulb depressions, indicate that the error varies in some way as the inverse vapor pressure. This leads to an investigation of the properties of superheated water vapor in the low pressure region upon which there is little available data.

A plot of this region on temperature-entropy coordinates was made. The saturation line was plotted from steam table data. Lines of constant pressure and of constant total heat were located by the use of the instantaneous specific heat equation of Goodenough and Felbeck, as given in Bulletin 139, University of Illinois Engineering Experiment Station, from which mean specific heats at constant pressure were calculated for the temperature range in question. The lines of constant total heat appear very nearly as isothermal, or constant temperature, lines also. This would have to be so if low-pressure steam is to be even approximately amenable to the laws governing perfect gases since, for the perfect gas, the heat content is dependent upon the temperature. Location of the constant total heat lines within 0.1° was impossible from steam table data where total heats of the saturated vapor are given only to the nearest tenth of a B.t.u., but the accuracy was sufficient near the saturation line to show the apparent trend. At very low vapor pressures well in the super-heat region, the lines of constant total heat so nearly parallel those of constant temperature that the relationship between them cannot be accurately determined.

The Joule-Thomson coefficient, that is, the drop in temperature with respect to the pressure drop for a gas during a throttling, or constant total heat, process

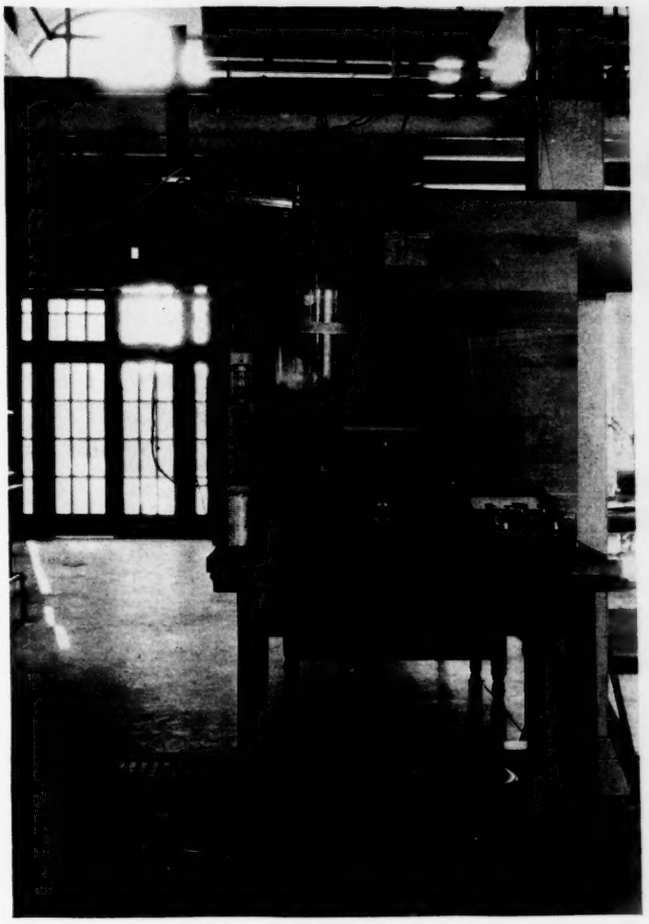


Fig. 5. Apparatus used to measure humidities in Laboratory at Penn State

is the criterion by which the departure of gases from perfect gas behavior may be judged. Generally speaking, the higher the Joule-Thomson coefficient, the more imperfect the gas. If, now, this be determined for water vapor in various parts of the region in which we are here interested, the comparative errors to be expected from calculations which assume perfect gas relationships in dealing with water vapor will be indicated. Solving for the coefficents at various vapor pressures at approximately constant temperature, it appears to increase as the pressures decrease. This is equivalent to increased wet bulb depressions at a fixed dry bulb temperature, the result being greater departure from perfect gas characteristics at lower wet bulb readings. Increasing coefficients are also indicated at successively lower temperatures in the superheat region for which calculations may be made with reasonable accuracy. This means larger deviations from the perfect gas as the temperature is lowered. Both of these conclusions are in accordance with the experimental data presented in the curves.

If any other factors than those which have been mentioned operate in any great degree to produce the deviations shown by the curves, they are not immediately apparent. With Joule-Thomson coefficients varying approximately from 1 to 3.6 in the region investigated, the departure of water vapor from perfect gas laws is probably sufficient in itself to account for the errors shown for calculated humidities.

Fig. 1. A completely air conditioned bakery at El Centro, California

Air Conditioning in Baking Plants†

By W. W. REECE‡

BEFORE going into details of application of air conditioning and refrigeration in baking plants, I want to give a short description of the bread-baking process.

The raw materials which the baker uses consist of flour, salt, sugar, malt, shortening, yeast, etc. Flour, being the most bulky, requires the most space, and is stored in sacks on skids easily portable to the flour-blending apparatus. Perishable materials requiring low storage temperatures, such as malt, milk, shortening, and yeast, are stored in a refrigerated cold room convenient to the flour storage and the ingredient and mixing rooms.

In the next step, these raw materials are incorporated in the dough mass in the mixers. After mixing, the sponges or doughs, placed in troughs, are fermented, an operation which requires 3 to 5 hr., depending on the character of the ingredients, formula, and temperatures. After fermenting and mixing, we have what the baker terms the make-up process, consisting of dividing the dough into proper loaf weight, the rounding, proofing, and molding. This operation is carried on mechanically.

After being placed in pans at the molding machine, the pans are racked and the racks go into the next step of the process—the proof room—where the dough rises, ready to go to the ovens.

After baking, the bread is dumped from the pans and is racked and goes through the conditioned cooling system, the pans, of course, returning on their racks to the make-up department.

The loaves are cooled for 1½ hr. and go to the slicing and wrapping machines, from whence they are packed in trays, the trays going into storage cages, and are finally loaded into the truck equipment for distribution to the retail store outlets in the territory.

From the time the raw material goes into the mixer until the loaf appears in its cellophane or waxed wrapper, the total of 7½ to 8 hr. has elapsed.

I would have you realize that temperatures and humidities are of some importance at all points in this process. They are of very critical importance at several points. I will try, later, to place the proper emphasis on these different points. I also wish you to realize that the process of bread making is one of the daily manufacture of a perishable product. Made today for sale tomorrow, it is readily apparent that if for any reason the process is off and the product is unsaleable, such product will never be made and sold. There is, therefore, no such thing as getting behind one day on production with the expectation of catching up the following day. Let us keep that point in mind in considering the importance of temperature and humidity control.

Fig. 1 shows a modern plant, built in 1929 in the lower Imperial Valley of California, which was designed to manufacture 2000 lb. per hr. of baked bread. It happens to be a very unique plant, as bakeries go, on account of the many problems which were encountered in its design, but I do not want to go into detail about them now.

Extreme climatic conditions in the Valley (temperatures as high as 120° in summer) necessitated complete air conditioning in all parts of the plant, with the exception of the loading room. One story in height and using special wall and foundation construction, it has so far successfully withstood the earthquake problem.

†An address before a joint meeting of the American Society of Heating and Ventilating Engineers, the American Society of Refrigerating Engineers, and the American Society of Bakery Engineers, Hotel Sherman, Chicago.

‡Director of Engineering, The W. E. Long Co., Chicago.

Material Storage

The ideal condition for flour storage is 78° with 75% R.H. Under such conditions, flour will retain its normal moisture content of 13.5%. Inasmuch as 75% R.H. is costly to maintain, the practical condition appears to be 73° and 65% R.H. In low humidities, say down to 50%, flour will shrink from a normal 13½% to about 8% moisture content. Low humidities, therefore, cause an excessive invisible loss and adversely affect costs. High humidities, say about 75%, will cause flour to absorb moisture gradually and deteriorate rapidly, lessening the quality of the finished product.

In the average bakery in the United States, I would not class flour storage conditions as being critical, or as requiring heavy expenditures for refrigeration or air conditioning equipment in order to control temperatures and humidities. Perishable materials, such as yeast, malt, milk, and shortening, are usually stored in refrigerated cold rooms at 40°.

Mixing

Mixing machines are powered approximately 3 hp. per 100 lb. of dough mixed. A 1,000-lb. mixer has a 30 hp. or 35 hp. motor. It is desired that the dough come out of the mixer at 78° to 80°, and therefore, refrigeration in some form is essential to offset the temperature rise during the mix, due to the power input of the motor.

Practically, this is accomplished by introducing 33° to 35° water into the mix and circulating water of approximately the same temperature around the jacket of the mixing bowl. The baker cannot avoid the use of refrigeration at this point in the process, although he may get it by using ice. Allow me to emphasize the point that 40° water, which is easy to obtain, does not solve the refrigeration problem at the mixer; 33° to 35° water does solve the problem.

In Fig. 3 is shown a well-arranged fermentation room. The troughs containing the sponges are suspended from overhead trolley tracks. The room is automatically conditioned by air distribution through a duct system from a humidifier, to 78° and 75% to 80% R.H., those being the ideal conditions for the fermentation of sponges and doughs.

This is the first step in the process where temperature and humidity are of critical and vital importance to the baker. Bear in mind, too, that the baking process, in order to secure uniform quality and low cost, should be synchronized and timed in operation.

With a proper installation for the fermentation room, it is found that:

1. Correct air temperatures of 78° to 80° and humidities of 75% are maintained. Fermentation periods do not vary. The quality, character, and flavor of the finished loaf is under control in so far as the fermentation process is concerned. Shop schedules are maintained with better efficiency and at a lower labor cost. A minimum of supervision is required, thus allowing the superintendent more time for his general duties.

2. Sponges and straight doughs no not crust and there are no lumps or streaks in the finished loaf from this source.

3. The fermentation loss is reduced to an average of 7/10 of 1% and there is a clear saving of approximately 7/10 of 1%. From an economic standpoint, this saving will usually return 30% to 40% yearly on the investment in humidifier equipment.

Make-Up Department

In the make-up process, which follows mixing and fermentation (see Fig. 4), the dough comes to the divider at 80°. Ideally, it should be maintained at that temperature all through the make-up process. If the dough hopper, being near the ceiling, is in extreme heat, there may be an undue temperature rise in the dough during the 15 or 20 min. it is in the dough hopper. There is some rise in temperature in the divider and a slight rise through the rounder. The dough travels

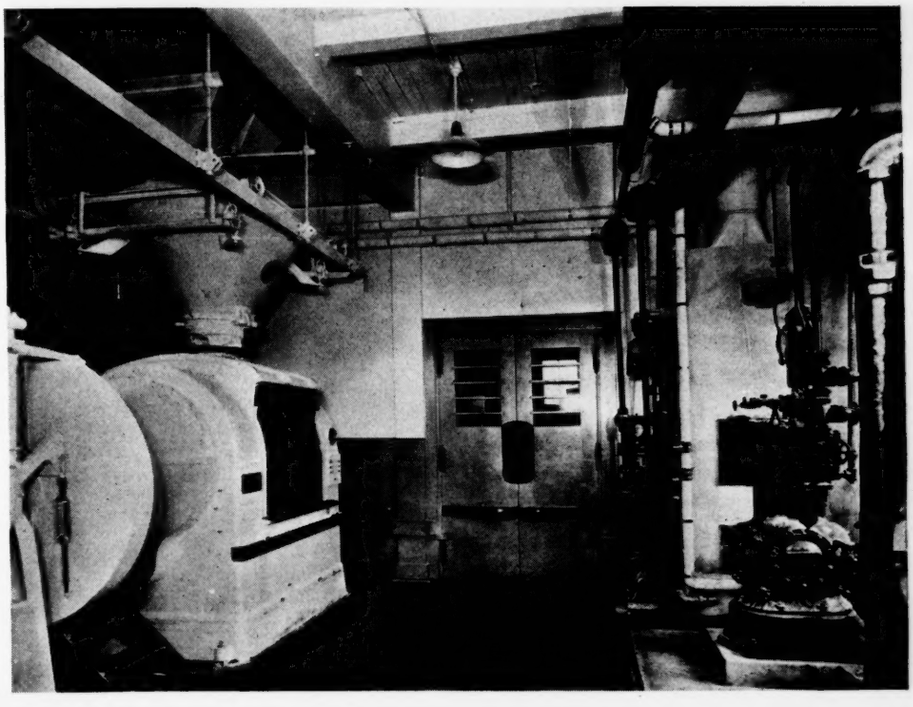


Fig. 2. Mixing room in a modern bakery. Materials are weighed and fed to the mixer through the hopper shown at the left. Refrigeration machinery at the right.

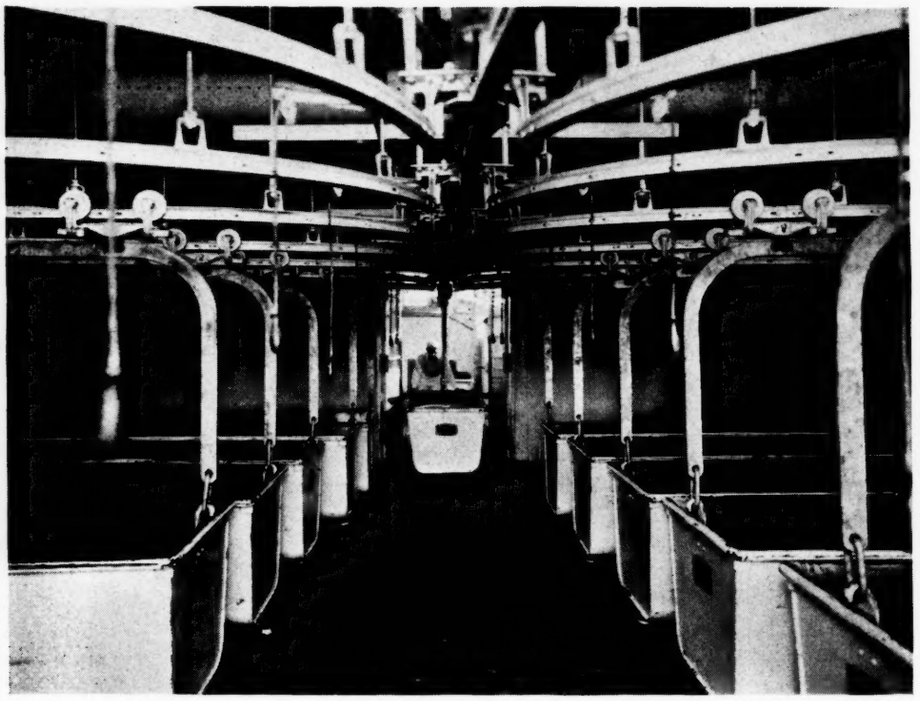


Fig. 3. A conditioned fermentation room, with overhead monorail for handling the dough. Air duct is plainly visible.

from 10 to 12 min. in the overhead proofer to condition itself for the molding operation. If, again, the room temperatures are excessive around the proofer, there may be an undue temperature rise in the proofer.

Very few bakeries have the make-up departments conditioned. Students of the industry feel that more attention needs to be paid to this problem by air conditioning engineers.

It is desirable that 80° and 60% to 70% R.H. be maintained in the make-up department. In other words, substantially a comfort condition is desirable and I predict that as the air conditioning industry further develops simple, low-cost humidifying and refrigeration apparatus, it will find a practical use and a considerable demand for such equipment in make-up departments of bakeries.

Proofing

The dough, after it is panned out of the molding machine, goes into racks which are immediately introduced into the proofing room so that the dough can go through the rising process preliminary to baking.

It is accepted practice in the industry that these rooms be controlled to 95° and 85% R.H. After fermentation, this is the second most vital step in the baking process, where temperatures and humidities are of critical importance. In an automatically humidified proof room, controlled to proper temperatures and humidities, the following operating results are obtained:

1. Doughs proof in a uniform length of time and shop schedules are maintained at this point in the process.

2. Quality is controlled, as, with an even air distribution, the dough in the pans is uniformly proofed from the bottom to the top of the rack.

3. Weight losses, however slight, due to proof boxes being too dry, are eliminated with controlled and sufficient humidity.

Here, again, the baker is fortunate in that the air conditioning industry has concentrated on this proofing problem and has made available good, well-designed, sturdily-constructed proofing units at reasonable cost.

No time will be taken in discussing the actual baking process. Baking is done at 450° to 500° and the oven manufacturer furnishes the facilities for providing this heat.

Bread Cooling

Cooling the baked bread is the third step where air conditioning is of vital importance and its use is accepted as sound practice. There are several methods by which the cooling of bread in conditioned air may be accomplished.

Fig. 5 shows a tunnel system for the cooling of bread on racks, and into which conditioned air is transmitted. Conditioned air is also furnished for the enclosed space taken up by the wrapping and slicing machine equipment. It is good practice to keep the finished loaf in conditioned air from the start of the cooling operation until the loaf is sliced and wrapped.

Air at 70° to 75° of a fairly high humidity is furnished, usually through an evaporative type of air washer. Air of the same condition is satisfactory for the wrapping machine enclosure except that the humidity possibly should be from 65% to 70%. Under such conditions, for the protection of the finished product, important advantages are found:

1. There is substantially no variation in cooling time. Standard varieties and sizes of breads will cool in a uniform length of time throughout the year. This cooling time will run 80 to 90 min. in 70° to 75° air. Shop schedules are then maintained at this point. The excess heat from the hot bread is eliminated from the shop, thus making working conditions more pleasant for the shop help. Deliverymen go out on their routes on time in the morning because they have not had to wait for bread to be cooled and wrapped.

2. The variable of evaporation loss during cooling is positively under control and is substantially constant at 0.35 oz. per lb., or slightly less, regardless of outside climatic conditions. Most users of these systems say

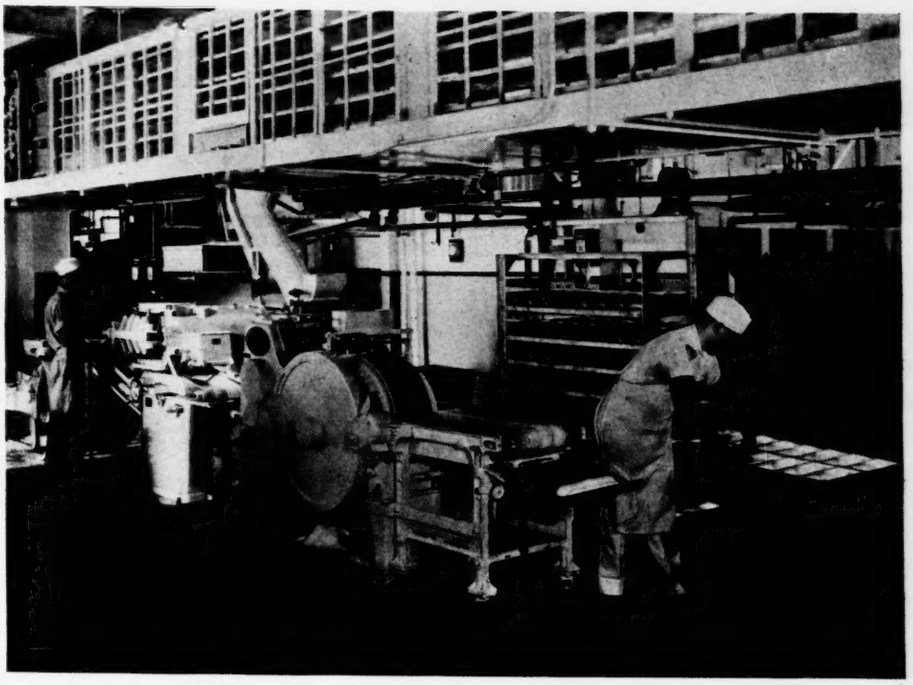


Fig. 4. The make-up department and conditioned proof room in a southern bakery.

that they save an average of ¼ oz. per 1 lb. loaf, which is an economic saving in itself sufficient to carry the overhead expense of an installation.

3. The variable of finished loaf condition is under control. The cooling operation, not being subject to changes of weather, drafts, and air currents, is stable, in that the same air condition can be reproduced day in and day out for any specific loaf or variety of bread. This has proved to be of utmost importance in promoting sales, particularly of those breads wrapped in cellulose or transparent wrappers, where good loaf appearance is so essential.

4. It logically follows that mold is definitely kept under control in conditioned air cooling. The loaf, being enveloped in washed air during the entire cooling, slicing, and wrapping period, is subjected to a minimum of chance for mold contamination, large annual losses resulting from mold in summer time cooling being substantially eliminated.

I do not mind admitting that I am a very strong exponent of air conditioning and its companion, refrigeration, and along this line just two things stand out in my mind.

First, I have discussed the three accepted applications of air conditioning in bakeries — fermentation control, proofing control, and conditioned bread cooling. The industry owes a debt of gratitude to air conditioning and refrigerating engineers for the development of good equipment. While the baker, operating as he does on a low margin of profit, has to be a careful buyer of equipment, I hope to see a gradual practical acceptance of air conditioning for storage rooms, make-up departments, and offices.

And, second, I like to look upon air conditioning and refrigeration in baking plants as a means of better management. If a baking plant owner provides himself with the proper air conditioning and refrigeration apparatus for adequately controlling essential portions of his process, he has accomplished several indirect things. The morale of the organization improves because the help realizes and appreciates the owner's interest in providing good manufacturing and working conditions. The manager, or owner, as the case may be, naturally takes more pride in his establishment.

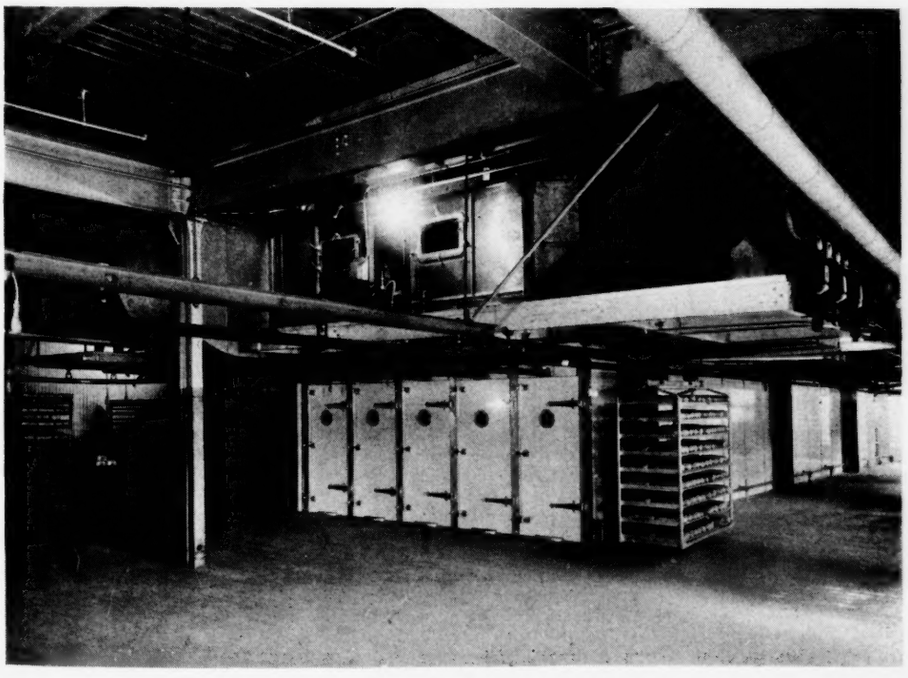


Fig. 5. Counterflow bread-cooling system in an eastern bakery, capable of handling 7000 lb. of bread per hour.

Temperature Drop of Air in Ducts†

By J. DONALD KROEKER‡

IN working on the first mechanical warm-air heating plant I designed, several years ago, I followed a method carefully set forth in a widely used manual arranged in rules 1, 2, 3, etc., giving directions for converting the heat required to air volume, velocities, and pipe areas necessary. The heating system, which included a trunk line following two sides of a basement approximately 50 ft. × 60 ft., was sold and installed as designed.

The heating season came along with an early cold snap and a very loud complaint. In particular, an office (of the chief officer of the company) which obtained its supply of heated air from the end of the system, or about 100 ft. from the source, was much underheated, while rooms nearer the heat source were overheated.

Anemometer and temperature readings were carefully taken. Anemometer readings were approximately those for which the outlets had been designed. But the temperature readings were headaches. At outlets near the heat source the register temperatures were 170° while in the office in question the register temperature was barely 100°. Fortunately, a blower of excellent characteristics had been selected and it was possible, by choking the supply ducts delivering near the source, to force enough additional air to the end of the system properly to balance the entire heating plant delivery.

Needless to say, I scrapped that manual and went back to fundamentals. Obviously, and simply stated, heat is lost from air passing through a duct if the duct is surrounded by a medium at a lower temperature. The loss of heat results in a reduction of the temperature of the air and, consequently, a greater amount of the cooler air must be supplied in a given case to offset the heat losses.

The manual said nothing about this and so gave no clue to even approximate allowances necessary to make for temperature drop.

A little study soon disclosed that the amount of heat loss from air in ducts or from ducts depends on the extent of the surface, temperature difference of the air

†Permission in writing must be obtained for reprinting this article in whole or in part.

‡Montag Stove & Furnace Works, Portland, Ore.

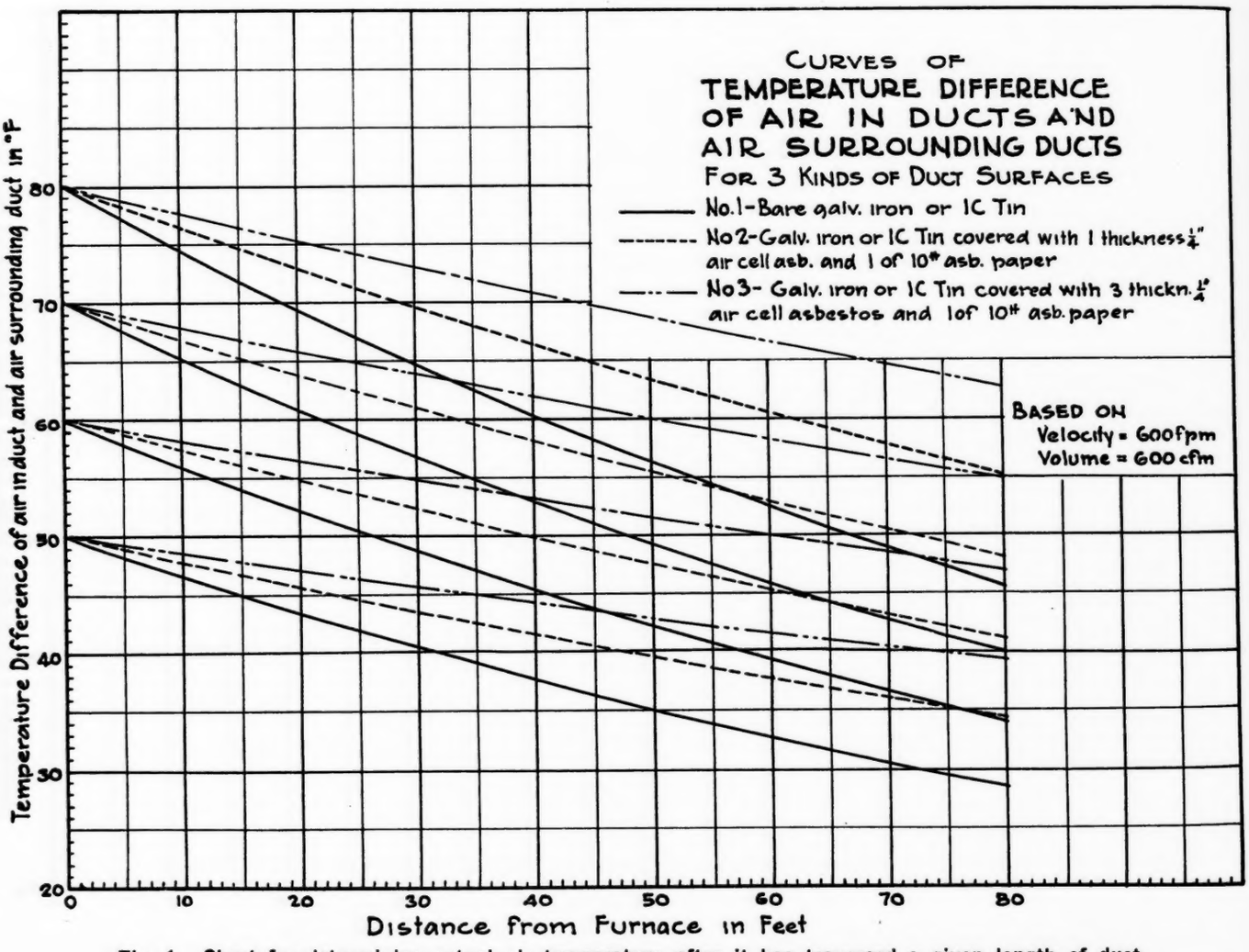


Fig. 1. Chart for determining actual air temperature after it has traversed a given length of duct

inside and the medium outside, time, and emissivity of the duct. What a lot of factors were omitted from that manual!

The emissivity or heat emission coefficient of any surface can be expressed in B.t.u. per square foot per degree per hour. It depends chiefly on the nature of the duct and its surface. It also depends on the velocity of the air and, to a minor degree, on the temperature of the surrounding medium, proximity of the duct to other surfaces, temperature and character of those surfaces, and other conditions.

No simple or accurate and infallible method seems to have been evolved for determining this emissivity coefficient by computation and comparatively very little work has been done to determine values of this factor experimentally for various types of ducts and duct surfaces. The most reliable and applicable results which have come to hand are those obtained and reported in Bulletin 117 of the University of Illinois Engineering Experiment Station. Unfortunately, they do not include all the types of ducts and insulations used in heating work, but they do include those most commonly used. Values for selected surfaces and insulations are given in Table 1.

There is an important difference between the test method used in obtaining these emissivity coefficients and actual conditions in heating work. The pipe surfaces are practically at steam temperature while, in the case of warm air in motion in a duct, the temperature of the duct may be considerably less than the average temperature of the air within it. The difference seems to vary somewhat with the type of surface inside the duct and the velocity, as well as probably some other and minor conditions. Definite information on the variations obtaining in tin and galvanized iron ducts does not seem available. At least, I have not been able to find any.

To use the air temperature as the temperature of the duct provides for an apparently appropriate safety factor, while making for simplification at the same time. It is the method I use in the absence of the necessary information for complete accuracy.

Knowing the emissivity coefficient, the heat loss from a duct may be computed from the following general formula: $H_L = AFt_d$ (1)
in which H_L is the heat loss in B.t.u. per hour, A is the area of the duct surface in square feet, F is the emissivity coefficient in B.t.u. per hour per degree per square foot, and t_d is the average temperature difference of the air inside and outside the duct.

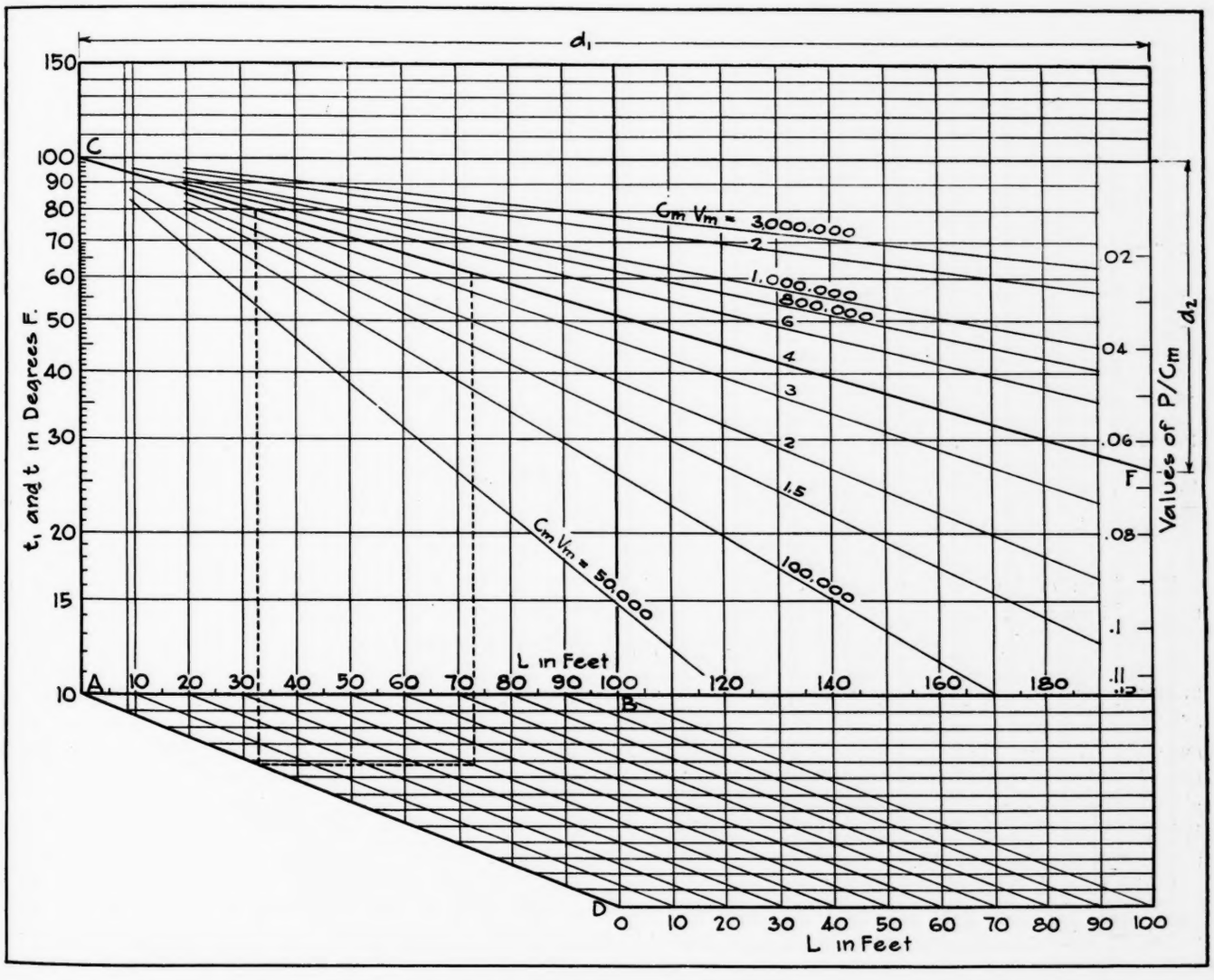


Fig. 2. Semi-logarithmic network chart for the determination of temperature drop from galvanized iron ducts

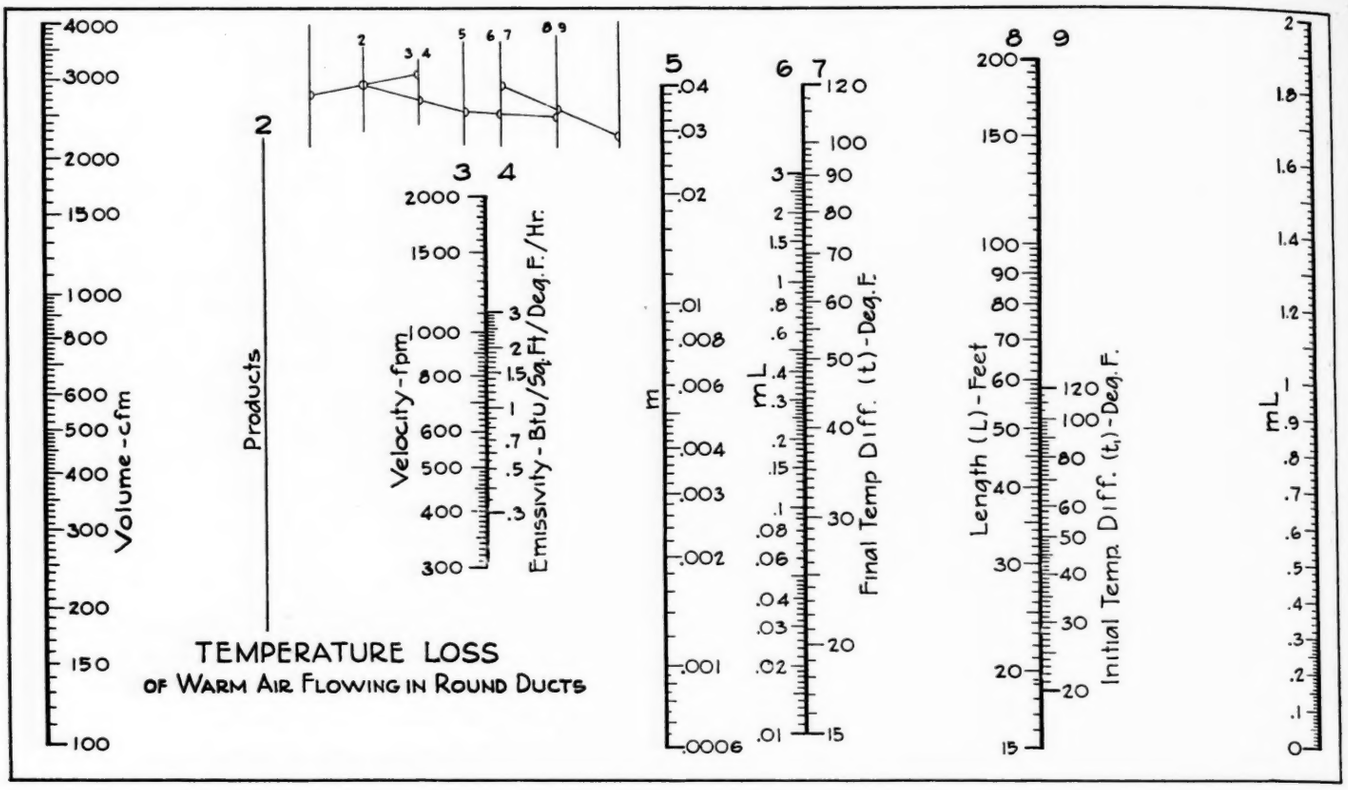


Fig. 3. Alignment chart for general application in determining temperature drop.

TABLE 1

EMISSIVITY COEFFICIENTS FOR DUCTS

No.	Description of Covering or Surface	Tin	Galv. Iron
1	Bare, no insulation	1.28	1.33
2	One thickness of air cell asbestos and one of 10-lb. asbestos paper	0.87	0.90*
3	Three thicknesses of ¼-in. air cell asbestos and one of 10-lb. asbestos paper	0.565	0.577
4	1½-in. asbestocel blocks, ½-in. asbestos cement, and cheesecloth wrapper	0.32*	0.326
5	Single ply of ⅛-in. carocel paper	1.12	1.15*
6	Two-ply ⅛-in. carocel paper	0.90	0.93*
7	Three-ply ⅛-in. carocel paper	0.70	0.72*
8	12-lb. asbestos paper, one ply	2.08	2.10*
9	12-lb. asbestos paper, two ply	1.88	1.90*
10	12-lb. asbestos paper, four ply	1.67	1.70*
11	12-lb. asbestos paper, six ply	1.39	1.42*
12	12-lb. asbestos paper, eight ply	1.26	1.29*

*Estimated by comparison.

For ducts of known dimensions, the equation, in terms of temperature reduction, takes the form

$$t_r = \frac{P\ L\ F\ t_d}{720\ C_p C_m} \qquad (2)$$

in which t_r is the temperature reduction for the section of duct in which t_d is the average temperature difference, C_p is the specific heat of the air at constant pressure, in B.t.u. per cubic foot per degree, and C_m is the air volume in c.f.m., p is the perimeter in inches, and L is the length in feet of the duct in which the average temperature difference is t_d.

In designing a duct system, air volumes and approximate velocities are known before duct sizes are computed. To me it seems most practical to determine at this juncture the corrections which it is necessary to make in air volume due to temperature drop. So a formula should be used which is based on these factors. This takes the form

$$t_r = \frac{.059\ F\ L\ t_d}{C_p \sqrt{C_m\ V_m}} \qquad (3)$$

and applies strictly only to round ducts. In this equation V_m is the velocity of the air in the duct in f.p.m.

A little analysis will show that

$$t = t_i\ e^{-mL} \qquad (4)$$

in which t_i is the known or assumed initial temperature difference or this difference at the point of beginning, e is the natural logarithm, t is the final temperature difference or the temperature difference at a distance L from the point where t_i holds, and m is the value of the remaining variables.

Finally, we can show that

$$\log t = \log t_i - \frac{.059\ F\ L}{C_p \sqrt{C_m\ V_m}} \log_{10} e \qquad (5)$$

and

$$\log t = \log t_i - \frac{p\ F\ L}{720\ C_p\ C_m} \log_{10} e \qquad (6)$$

Equation (5) is the most useful in design work because to solve it information on pipe sizes, which is not available in the preliminary considerations, is not required. Equation (6) is useful, however, to make a check using the pipe sizes after they have been established to determine the accuracy of the preliminary computations for temperature drop and possibly for making required slight adjustments where rectangular ducts are used. For the solution of Equation (5), we have to know only the volume of air required as computed by either uniform or estimated register temperatures and velocities, which are established approximately in other design operations.

Neither of these formulas lend themselves to rapid routine calculation. However, having the formulas it

is a small matter to construct simple charts covering the particular type of system and construction one uses most frequently, by use of which temperature loss in ducts may be quickly found.

If we are concerned always with the same type of duct surface and insulation and approximately the same velocities and air volume, we may construct curves such as in Fig. 1 for several values of t_i, or we may construct straight line graphs such as shown in the semi-logarithmic chart, Fig. 2.

The curves given in Fig. 2 are for bare round galvanized-iron ducts for various values of m obtained with the products of C_m and V_m indicated. A scale at the right gives values of p/C_m for the same type of duct surfaces and by means of it curves may be drawn similar to those shown, from which temperature drops in galvanized-iron ducts of known sizes may be determined.

As an example of the use of Fig. 2, assume a volume of 500 c.f.m. and a velocity of 800 f.p.m. in a bare round galvanized-iron duct in which the air temperature is 140° at the point of beginning and the temperature of the air surrounding this duct is 60°. The air temperature in the duct 40 ft. from this point is required.

The initial temperature difference t_i is 140 — 60, or 80° and C_mV_m is 400,000. From $t_i = 80$ at the left of the chart go to the right to intercept line CF ($C_mV_m = 400{,}000$); from here drop to the line AD and proceed to the right to the inclined line indicated as L = 40 ft.; from here return to the curve for $C_mV_m = 400{,}000$, and read t, the temperature difference at the required point; namely, 61½°. The air temperature required is then 61½° plus 60°, or 121½°.

Fig. 3 is for the solution of Equation (5) for round ducts, for any values within the limits of scales of emissivity coefficients, air volumes, velocities, lengths, and initial temperature differences. Consequently, it is more useful than Fig. 2 when the different factors involved vary between wide limits.

To use Fig. 3 for the solution of the problem given above in exemplification of the use of Fig. 2, align air volume, 500 c.f.m. on the extreme left scale with velocity, 800 f.p.m. on scale 3, obtaining a point on 2; align this with 1.33, the emissivity coefficient, on scale 4, obtaining an intercept on scale 5; align this with length, 40 ft., on scale 8 and read the intercept on scale 6, giving values of mL; namely, 0.265. Now locate this same value, 0.265, on the last scale and align with the initial temperature difference, 80° on scale 9 and read the intercept on scale 7, which is the final temperature difference; namely, 61½°. Then the temperature of the air in the duct at the required point is 61½° plus 60°, or 121½°.

For the sake of speed in design it is often desirable to determine the length of duct in which the temperature drop is a certain number of degrees rather than to find the temperature of the air at a given point. Thus, to find the distance in which a 10° reduction in temperature takes place, the other conditions being as given in the above example, proceed as follows:

Align 80°, the initial temperature difference, on scale 9 with 70°, the final temperature difference, on scale 7, reading the intercept on the last scale, mL = 0.15. Then proceed as above, aligning scales 1, 3 and 2, and 2, 4, and 5. Now align the intercept on scale 5 with the value obtained for mL, 0.15, on scale 6, and read the intercept on scale 8; namely, 24 ft. Thus, 24 ft. from the point in the duct at which the temperature is 140°, the temperature is only 130°.

Welding Yellow Brass Pipe

THE welding of brass pipe calls for nothing unusual in pipe welding technique and can be easily done by any operator competent to weld steel pipe. Welding of yellow brass pipe of this composition, in which the melting point of the base metal so closely approximates the melting point of the bronze welding rod, is really a cross between fusion welding and bronze-welding. The essential factor is to melt the wall of the vee just sufficiently to insure positive sweating of the base metal in advance of the puddle. As in all bronze-welding, a suitable flux should be used.

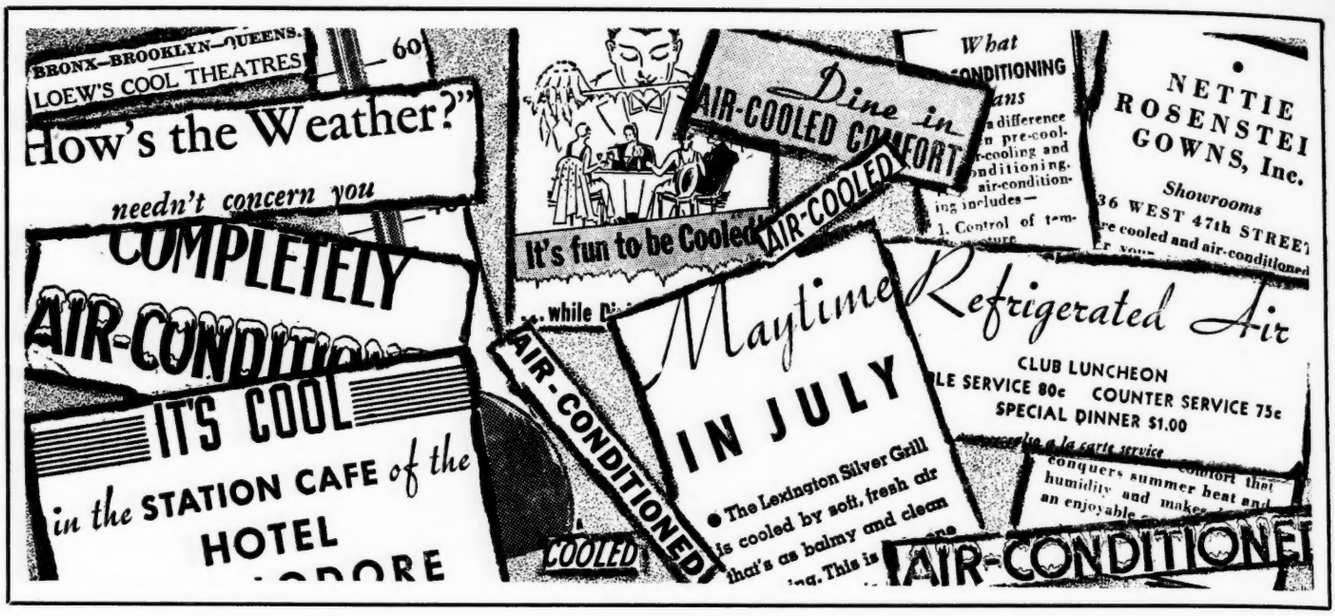
Rotation welds offer no difficulty whatsoever, requiring only a little longer time to start welding because of the higher heat conductivity of brass as compared to steel. Puddling and manipulation of rod and flame are the same as in steel welding with forehand technique. Overhead welding likewise is easy and not at all complicated. The welding, as for steel pipe, merely requires the proper manipulation of rod and flame in controlling the puddle.

Welding brass pipe in a fixed vertical position is less easily accomplished, as is true with steel pipe, but here likewise any operator competent to weld steel pipe in this position can control and deposit the bronze weld metal with ease. It was formerly supposed that the bell type of joint would facilitate welding of vertical pipe such as risers because of the shelf supplied by the bell, but actual investigation proves that the butt type joint can be as readily welded as the bell type in the larger diameters where the wall thickness is ⅛ in. and greater. A suitable technique is to deposit the metal in a sloping puddle, directing the flame upward so as to retain the molten metal, at the same time manipulating the rod in the puddle to prevent excessive melting of the upper half of the joint and to solidify the puddle in even ripples. This again is similar to ordinary steel pipe welding technique.

As this brass contains a small amount of lead, there is a tendency for the base metal to honeycomb slightly at the edge of the weld, but this is only a surface factor and is unimportant.

The welding should be done with a slightly oxidizing flame, since a drift of the flame to a reducing adjustment (excess acetylene) would cause excessive boiling.

—From "Oxy-Acetylene Tips."



Air Conditioning Progress Shown by Survey of Existing Installations

Report furnishes clue to how many air conditioning jobs are now in operation

EFFORT which has been put into the air conditioning industry for a number of years is bringing results at a rapidly increasing rate, according to a survey conducted last summer by E. W. Lloyd, vice-president of the Commonwealth Edison Co., Chicago.[1] The survey showed that the number of conditioning installations made in 1933 was, in most cities, larger than previous years and in some cases even greater than the total of all previous years.

Mr. Lloyd's survey was made by questioning 12 electric utilities, the objective being to determine practical means of obtaining air conditioning load for the utilities. Companies queried were asked how many installations they had on their lines; what the connected horsepower was; how many of these were made in 1932 and prior to that year, and how many from the beginning of 1933 to the last of August, 1933. The total number of installations reported by these utilities was 1751.

Nearly a year ago HEATING AND VENTILATING conducted a survey to determine just how many air conditioning installations were in use.[2] The figures obtained were complicated by the difficulty in obtaining data on the small and the very large cities, and also by the fact that no clear cut distinction could be drawn between a first class house-heating system with modern appurtenances and a large cooling system for a theater. At that time we concluded that the total number of air conditioning systems did not exceed 3000.

It seems fair to assume that utility records of air conditioning jobs on their lines are as accurate a method of estimating the total number as there is. It also seems reasonable that, up to the present at least, there are far more systems installed per million population in the larger cities than in the smaller towns and cities. The total shown in Table 1, then, including as it does the utilities serving the largest cities, does not seem out of line with the previous estimate of a total in the country of not over 3000.

Table 1 shows the number of conditioning systems on the lines of the 12 utilities broken down into types of buildings served. This table, based on Mr. Lloyd's report, agrees in total with his report, but there may be minor discrepancies in the sub-totals. The reason for this is that the company listings were not all broken down in exactly comparable terms. For example, a number of utilities report funeral parlors separately, while we have totalled these with the stores.

The last column of Table 1 gives the names of the utilities reporting, and for which the figures apply. It is important to note that the New York figures are those for New York Edison, which covers Manhattan and the Bronx, and apparently do not include Brooklyn. Also, in the case of the Pacific Coast companies—Pacific Gas & Electric Company and Southern California Edison

[1] "Air Conditioning Progress," by E. W. Lloyd. Presented at the 40th annual meeting of the Association of Edison Illuminating Companies.

[2] "Just Where Does the Small Building Cooling Situation Stand?", HEATING AND VENTILATING, July, 1933, page 27.

TABLE 1

NUMBER OF AIR CONDITIONING PLANTS INSTALLED IN LARGE CITIES UP TO AUGUST 31, 1933

City or District	Banks and Offices	Restaurants and Hotels	Stores	Industrial	Residential	Theaters	Others	Total	Figures Cover Territory Served By
Chicago	73	62	29	34	31	49	18	296	Commonwealth Edison Co.
Chicago District	1	5	9	6	15	12	—	48	Public Serv. Co. of North Illinois
Detroit	12	17	21	4	12	12	6	84	Detroit Edison Co.
Milwaukee	3	1	5	—	—	8	1	18	Milwaukee El. Rwy. & Light Co.
New York	267	88	18	—	47	46	63	529	N. Y. Edison Co.
San Francisco District	66	28	39	29	2	28	29	221	Pacific Gas & Elect. Co.
Philadelphia	39	11	20	48	50	25	8	201	Phila. Electric Co.
Cleveland	8	8	4	1	6	9	4	40	The Cleveland Electric Ill. Co.
Los Angeles District	—	1	—	18	—	—	—	19	So. California Edison Co.
St. Louis	40	15	24	15	53	8	—	155	Union Elect. Lt. & Power Co.
Cincinnati	5	15	18	9	16	9	2	74	The Union Gas and Elec. Co.
Baltimore	18	10	7	9	7	11	4	66	Cons. Gas, El. Lt. & Power Co. of Balt.
TOTAL	532	261	194	173	239	217	135	1751	

Company—the first column lists the general territory served by these companies' lines, but the figures may or may not include all air conditioning jobs in the San Francisco and Los Angeles area.

While Table 1 is valuable in indicating *number* of jobs, it gives no clue to *size*. The rather small number of industrial installations may, in capacity, easily outweigh the total of store, residence, and "others." From the standpoint of numbers, however, it is worth noting that the systems in banks and offices outnumber any other single group, followed by residential, with theaters third. Here again, though, while a single unit in an office counts as much as a large theater in numbers, it is probably true that theaters may lead both offices and residences in capacity.

The "Others" group contains a varied list of jobs, among which are museums, railway station, a prison (!), schools, and dancing academies. Hotels have been grouped with restaurants since often the hotel system is one primarily for its own coffee shop or dining room.

TABLE 2

NUMBER OF AIR CONDITIONING PLANTS INSTALLED IN AND PRIOR TO 1933

	No. Installed Prior To 1933	No. Installed 1933 (To Aug. 31)
Chicago	176[1]	120[2]
Chicago District	23	25
Detroit	52	32
Milwaukee	5	13
New York†	220[3]	309[4]
San Francisco Dist.	212	9
Philadelphia	181	20
Los Angeles Dist.	7	11
St. Louis	91	64
Cincinnati	44	30

[1]*Totalling* 13,965 *tons of refrigeration.*
[2]*Totalling* 2,367 *tons of refrigeration.*
[3]*Totalling* 8,880 *tons of refrigeration.*
[4]*Totalling* 4,000 *tons of refrigeration.*
†1933 *New York figures to July* 31 *only.*

TABLE 3

SIZE OF AIR CONDITIONING PLANTS INSTALLED IN AND PRIOR TO 1933

	Connected Hp. Prior To 1933	Hp. Added In 1933 (Up To Aug. 31)
Chicago	25,376	2,367
Chicago Dist.	2,938	450
New York	13,645	5,655
Philadelphia	14,134	338
Los Angeles Dist.	660	727
St. Louis	4,898†	577†
Cincinnati	3,681	483

†*Figures for St. Louis in kilowatts.*

Table 2 shows the total number of systems classified according to the time the job was installed—whether prior to January 1, 1933, or during 1933 up to August 31, 1933. The Cleveland and Baltimore data were not so broken down. Note that New York installed 309 jobs in 8 months of 1933, while only 220 jobs were put in in the years prior to that. Milwaukee is also outstanding in the ratio of jobs installed in 1933 compared to previous years.

The answer to this unusual showing is found in Table 3 where the horsepower of these jobs is given. For New York, the average job installed prior to 1933 had a connected load of 62 hp., while the 1933 jobs averaged only 18.3 hp. The Chicago report shows a 144 hp. average for early jobs, 19.7 for 1933 jobs. Cincinnati averaged 83.5 for early installations and 16.1 hp. for 1933 jobs.

In other words, the great increase in *number* of jobs installed in 1933 was probably due to the increased effort in selling the idea of small units.

Commenting on the Chicago figures, Mr. Lloyd writes: "A survey was made in Chicago early this year (1933) to find and compile the information on all air conditioning installations made *prior* to 1933 . . . it is seen that the average tonnage of refrigeration per installation was about 80 and the average horsepower connected 144."

Regarding the 1933 jobs in Chicago, the author says: "The average tonnages and horsepower connected for the various classes of installation are probably a better criterion of what may be expected as a general run of applications in the immediate future. It is noted that some of the installations run up to 400 hp., 19 are above 30 hp., and the remaining 101 are of sizes from 5/8 hp. and up to 30 hp. In the group above 30 hp., theaters represent the largest group, which would indicate that practically every solvent theater is an immediate prospect. Other public gathering places, which include ballrooms, auditoriums, night clubs, etc., can be placed in the same category, as the public during 1933 has given definite indications that it will give its patronage where its comfort is catered to.

"In the group having installed capacities below 30 hp., restaurants and business offices have been the most easily sold this summer."

A Rule for Figuring Cooling Effect of Extended Surface

By CHESTER J. SCANLAN†

After experiment and analysis the author concludes that there is a general rule and that it can be easily applied. The rule states that for any given air velocity and refrigerant temperature the capacity of an extended surface cooler is proportional to the heat content of the entering air. Examples of the application are given here.

MUCH discussion and speculation have occurred regarding the process of cooling air with extended surface—a process which is the reverse of heating air with this kind of surface. Every manufacturer can furnish complete performance tables when his surface is used to heat air, but when the cooling process is mentioned, guessing too often replaces test data. This condition exists because in the process of heating air the water vapor present, under normal conditions, may be neglected without causing serious error in the calculations; while in the cooling process water vapor is an important factor.

In most cooling problems water vapor is condensed, giving up the latent heat of evaporation, which must be absorbed by the surface. The presence of this latent heat increases the capacity of the surface by increasing the quantity of available heat.

It has been a common practice to estimate the heat transmission in the process of cooling by using a coefficient of transmission per degree mean temperature difference. In most cases these values have been determined when the flow of heat was away from the surface, and of course the dry air temperatures are the only ones available for this type of calculation.

In such cooling calculations it is customary to add a percentage to the coefficient for dry air, supposedly for the increase due to the presence of a wet surface. However, the reason for a greater capacity with a wet surface than a dry one is that the moisture on the surface is an indication of the freeing of latent heat. If the moisture is not the result of condensation, no increase in transfer will result.

Therefore, whenever condensation occurs liberating the latent heat of evaporation in the process of cooling air, any method of calculation based upon dry-bulb temperature differentials is not really rational and may be greatly in error.

Inasmuch as all changes of condition occur at constant pressure, the term "heat content" can be used correctly. Therefore, any change in the heat content of the air and water vapor represents the cooling effect of the surface.

†Engineer, Bloomington, Ill.

It is evident that a change in heat content is indicated by a drop in the dry-bulb temperature, and also that when the temperature of the surface is below the dewpoint of the entering air, condensation will result. Thus, we may have in the cooling process two sources from which heat must be absorbed; namely, the dry air and the water vapor.

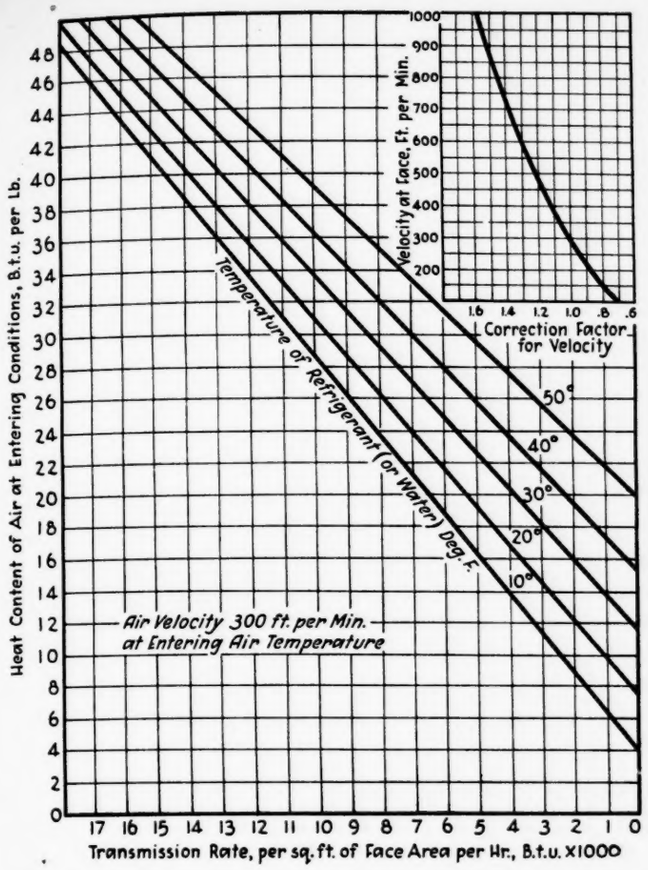
Referring to a recent article by Professor Goff[1] we find under the heading "Wet-Bulb Temperature" . . . "If the given mixture (of air and water vapor) is made to move continuously over the surface of a film of liquid (or solid), this surface becomes covered with a thin layer of air and water vapor in which are established more or less steep temperature gradients. Moreover, the mixture right at the surface becomes saturated."

The wet-bulb condition described above is an adiabatic exchange of heat, whereas in the exchange of heat in the cooling of a mixture of air and water vapor for comfort, heat is absorbed from the mixture by the cooling surface. The flow of heat from the mixture of air and water vapor to the cooling surface is opposed by the resistance of a layer of saturated air and water vapor. This resistance is subject to calculation, and recent tests have shown that the net heat flow from the initial mixture to the saturated mixture is proportional to the difference in total heat contents. A mathematical discussion of this process is not within the scope of this article. However, when the total heat content of the air and water vapor mixture corresponds to the total heat content of a saturated mixture at the temperature of the cooling surface (refrigerant temperature), the net heat flow will be zero.

As a result of these several considerations and the support of considerable test data it appears that a general rule regarding the behavior of extended surface coolers can be set up as follows: *For any given air velocity and refrigerant temperature the capacity of an extended surface cooler is proportional to the heat content of the entering air.*

This rule permits arranging data from tests on extended surface coolers into convenient and usable form

[1]"Air Conditioning Theory," published in *Refrigerating Engineering*, January, 1933. The author acknowledges the assistance received from Prof. J. A. Goff in preparing his present article.


Heat Content of Air at Entering Conditions, B.t.u. per Lb.
Transmission Rate, per sq. ft. of Face Area per Hr., B.t.u. X1000
Velocity at Face, Ft. per Min.
Correction Factor for Velocity
Temperature of Refrigerant (or Water) Deg. F.
50°
40°
30°
20°
10°
Air Velocity 300 ft. per Min. at Entering Air Temperature

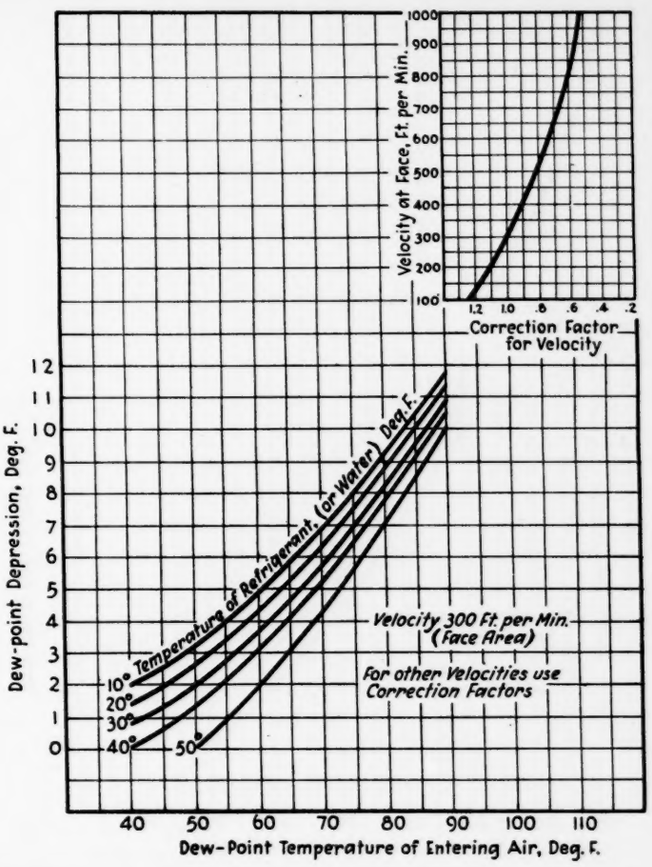
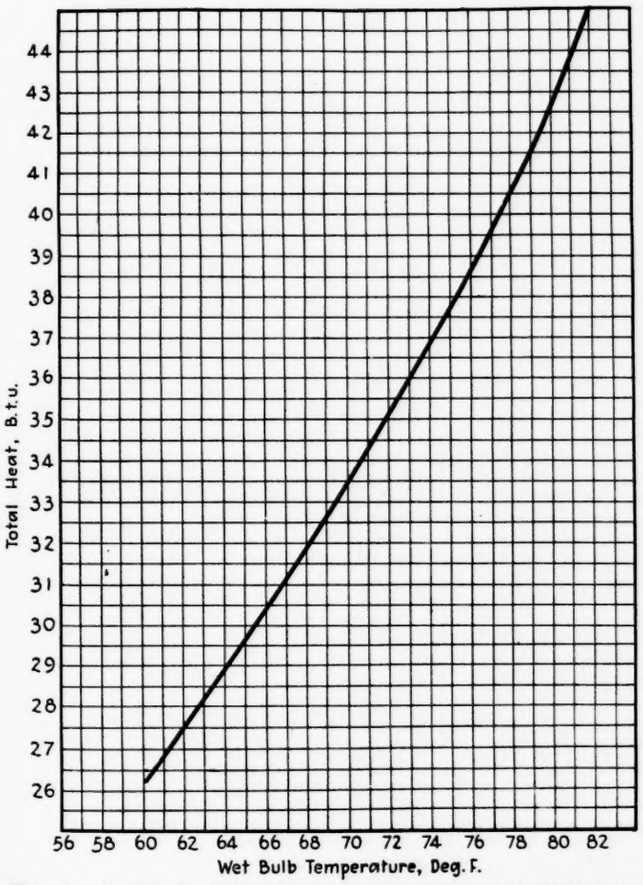


Fig. 1. (Left) Chart showing relationship between the heat absorbed by a given extended surface cooling unit and the condition of the entering air for varying air velocities at the face. Fig. 2. (Right) Chart showing the relationship between the dew point temperature depression and the entering dew-point temperature for a given extended surface cooling unit, operating at various air velocities.



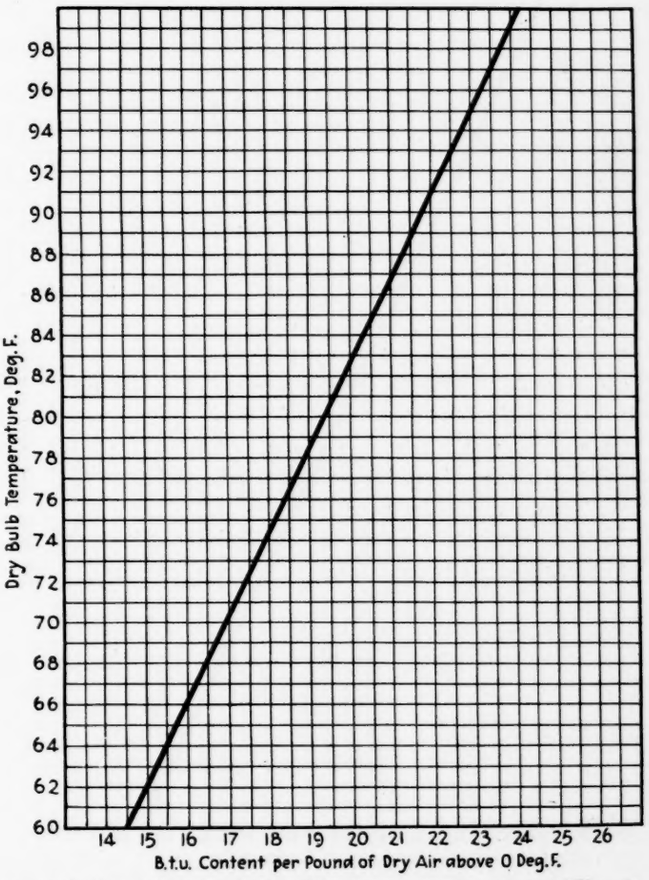


Fig. 3. (Left) Relationship between the wet bulb temperature and the total heat, in B.t.u. per pound of dry air, for mixtures of air and saturated water vapor (from Goodenough's tables). Fig. 4. (Right) Corresponding dry bulb temperatures and heat contents, in B.t.u. per pound of dry air (from Goodenough's tables).

from which solutions of practical problems can be made. In arranging the data for use it must be kept in mind that under certain conditions the dry-bulb temperature will be reduced without a corresponding lowering of the dewpoint, producing a higher relative humidity of the leaving air than that of the entering air. This may produce very uncomfortable atmospheric conditions. Therefore, in the solution of any cooling problem, it is very important that the final dewpoint temperature, as well as the final dry-bulb temperature, be subject to determination for the various entering air conditions, refrigerant temperatures, and air velocities.

The accompanying curves illustrate how the general rule may be applied to actual calculations. Specifically, the data shown in Figs. 1 and 2 apply only to the particular surface tested. Each make of extended surface would have its own peculiar curves which can be found by test. It is apparent, therefore, that the data from these two figures should not be used for all kinds of extended surface coolers. They serve entirely as an example of how the general rule can be applied. It is believed, though, that this general method of presenting test data can be widely used. The curves of Figs. 3, 4, and 5 are general in character and apply regardless of the particular make of extended surface used. The following problems illustrate the details of the method:

Problem 1. To find the cooling capacity of an existing installation, the condition of the leaving air, and the amount of latent and sensible heat absorbed.

Air enters cooler at 85° dry bulb and 74° wet bulb. Cooler has a face area of 50 sq. ft. and 25,000 c.f.m. pass through it with a face velocity of 500 f.p.m. The cooling medium is water at 40°.

Solution: Dewpoint temperature of entering air is found by psychrometric chart to be 69.3°.

The weight of dry air (from PV = W R T: 60 x 14.7 x 144 x 25,000 = W x 53.34 x 544.6) is 109,200 lb. per hr.

On Fig. 3 read opposite 74° and find total heat of entering air = 36.8 B.t.u. per lb.

Enter Fig. 1 at 36.8 B.t.u. and proceed horizontally to 40° refrigerant line, then vertically downward to bottom scale and read heat transfer rate as 10,300 B.t.u. per sq. ft. of face area per hour. Fig. 1 is plotted for an air velocity at the face of 300 f.p.m., and a correction factor, 1.2 for 500 f.p.m., is found from the correction curve. Total heat removed = 50 × 10,300 × 1.2 = 617,000 B.t.u. per hr.

Now to find how much of this is latent, how much sensible, proceed as follows:

$$\frac{617{,}000}{109{,}200} = 5.66 \text{ B.t.u. per lb. dry air per hr.}$$

Entering total heat	=	36.80 B.t.u. per lb. (Fig. 3)
Heat removed	=	5.66 B.t.u. per lb.
Final total heat	=	31.14 B.t.u. per lb.

Final wet-bulb temperature from Fig. 3 = 67°. Enter Fig. 2 at 69.3° on bottom scale and proceed vertically to 40° refrigerant temperature, then horizontally to find 5.0° dewpoint drop on scale at left. This represents the value at 300 f.p.m., and a correction factor of 0.81 from the correction curve must be applied, giving 4.05 as the dewpoint depression for 500 f.p.m.

Entering dewpoint	=	69.30°
Drop dewpoint	=	4.05°
Final dewpoint	=	65.25°

From Fig. 5 the latent heat of the vapor in a mixture having a dewpoint of 65.25° is 14 B.t.u. per lb. of dry air.

The heat content per pound of dry air = 31.14 (total heat) — 14 (latent heat) = 17.14 (sensible heat).

Enter Fig. 4 at 17.14 on bottom scale and find the corresponding dry-bulb temperature of the leaving air = 70.7°. Thus we have established the final air conditions.

Find moisture removed from air from Fig. 5 by reading:

Initial condition	=	0.0154 lb. per lb. of dry air
Final condition	=	0.0133 lb. per lb. of dry air
Moisture removed	=	0.0021 lb. per lb. of dry air

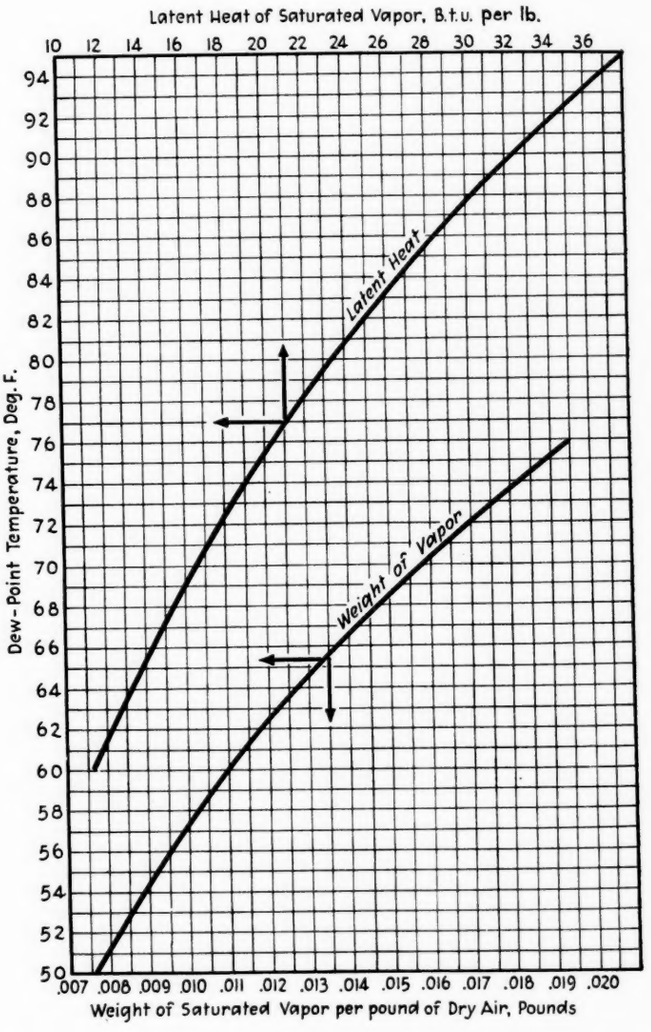

Latent Heat of Saturated Vapor, B.t.u. per lb.
10 12 14 16 18 20 22 24 26 28 30 32 34 36
94 92 90 88 86 84 82 80 78 76 74 72 70 68 66 64 62 60 58 56 54 52 50
Dew-Point Temperature, Deg. F.
Latent Heat
Weight of Vapor
.007 .008 .009 .010 .011 .012 .013 .014 .015 .016 .017 .018 .019 .020
Weight of Saturated Vapor per pound of Dry Air, Pounds

Fig. 5. Chart indicating relationship between latent heat of saturated vapor and dewpoint temperature, and weight of saturated vapor, per pound of dry air, and dewpoint temperature (from Goodenough's tables).

Total moisture removed = 0.0021 × 109,200 = 230 lb. per hr.

230 × 1050 B.t.u. = 242,000 B.t.u. per hr. latent heat
109,200 × 0.24 × 14.3 = 375,000 B.t.u. per hr. sensible heat

Total = 617,000 B.t.u. per hr.

Problem 2. To determine face area required to produce specified conditions of leaving air.

25,000 c.f.m. of air at 88° dry bulb and 77° wet bulb is to be delivered at 75° dry bulb and 70° wet bulb. The face velocity is 500 f.p.m., and the cooling medium is water at 40°. What is the required face area?

Solution: From psychrometric chart:

Dewpoint of entering air = 73°
Dewpoint of delivered air = 68°

60 × 25,000 cu. ft. × 14.7 × 144 = W × 53.34 × 547.6
W = 108,500 lb. = total weight of air handled per hour

Find heat removed (from Fig. 3) as follows:

Entering total heat = 39.5 B.t.u. per lb. dry air
Delivered total heat = — 33.5 B.t.u. per lb. dry air

Heat removed = 6.0 B.t.u. per lb. dry air

Total heat removed = 108,500 × 6 = 652,000 B.t.u. per hr.

From Fig. 1, using correction factor of 1.2 found from upper curve, we find that, for the entering condition, with total heat 39.5 B.t.u. per lb., and a refrigerant temperature of 40°, 13,800 B.t.u. are removed per hour per square foot of face area.

Therefore, the required face area will be 652,000 ÷ 13,800 = 47.3 sq. ft.

Since the data shown in Figs. 3, 4, and 5 are from general laws, it will be noted that these problems can be solved by the use of test curves like Figs. 1 and 2, and a psychrometric chart instead of using Figs. 3, 4, and 5. Also, since these curves are plotted from standard tables, these tables can also be used if desired instead of the data in Figs. 3, 4, and 5.

New Low Temperatures Established This Winter

THE winter that is now passed had interesting climatic features. February, 1934, will long be remembered in the middle Atlantic and New England states as the coldest month of any in 63 years of record at New York and Boston, and the coldest February ever in Pittsburgh, Buffalo, and Albany, where it averaged almost 12° below normal. Below zero weather was recorded on March 9 throughout Indiana, Ohio, and the Virginias. Everywhere in New York and New England that day it was 15° to 20° below zero.

This was due to the southward flow of frigid air across the provinces of Ontario and Quebec, while from Manitoba to Alaska and, consequently, in the middle-western states, milder weather obtained. Thus, while the temperature at St. Louis and Chicago was below normal on the average, it was far from being record-breaking, as it was in the East.

The storm-beaten track of transcontinental areas of low barometer is via the Lake region and the St. Lawrence valley. Strangely enough, two of five February storms passed northeastward, two over Hudson Bay, and three off the coast of New Jersey, Long Island, and New England. The barometric pressure over New York and New England thus averaged considerably higher than normal.

The severe cold waves recurring in February with such regular periodicity over the cold region eastward of Ohio and the Lakes brought about such evenness of atmospheric distribution that the average hourly wind velocity (midnight to midnight) differed very little from day to day.

Although the winter brought unprecedented low temperatures and prolonged periods of abnormally cold weather throughout the New England and Middle Atlantic States, unusually mild weather for this season was the rule in nearly every other section of the country. A report received from the U. S. Weather Bureau at Cheyenne, Wyo., states that for that locality December, 1933, and January, 1934, were the warmest December and January on record, and that February also was abnormally warm. Portland, Ore., enjoyed the warmest winter of its history this year, and Bismarck, N. Dak., had the second warmest winter since the establishment of its weather station. Previously established record cold temperatures were not even approached in most localities throughout the South and West.

Heating systems in the northeastern part of the country were taxed to their utmost during the cold periods occurring late in December and the middle of February. In many cases, high winds accompanied the extremely low temperatures, adding to the load thrown upon the heating equipment. The following table lists the new low temperature records established this winter, together with the wind velocity at the time the minimum temperatures were recorded:

City	Temperature	Wind Velocity M.P.H.
Baltimore, Md.	— 7°	21
Boston, Mass.	— 18°	21
Buffalo, N. Y.	— 21°	10
Burlington, Vt.	— 29°	6
Eastport, Me.	— 23°	13
Grand Rapids, Mich.	— 16°	11*
Ithaca, N. Y.	— 23°	3
New Haven, Conn.	— 15°	12
New York, N. Y.	— 14°	15
Philadelphia, Pa.	— 11°	24
Providence, R. I.	— 17°	15
Rochester, N. Y.	— 22°	3
Scranton, Pa.	— 19°	9
Syracuse, N. Y.	— 24°	5
Trenton, N. J.	— 14°	13

**Same as previous record.*

Special Problems in Selecting Motors

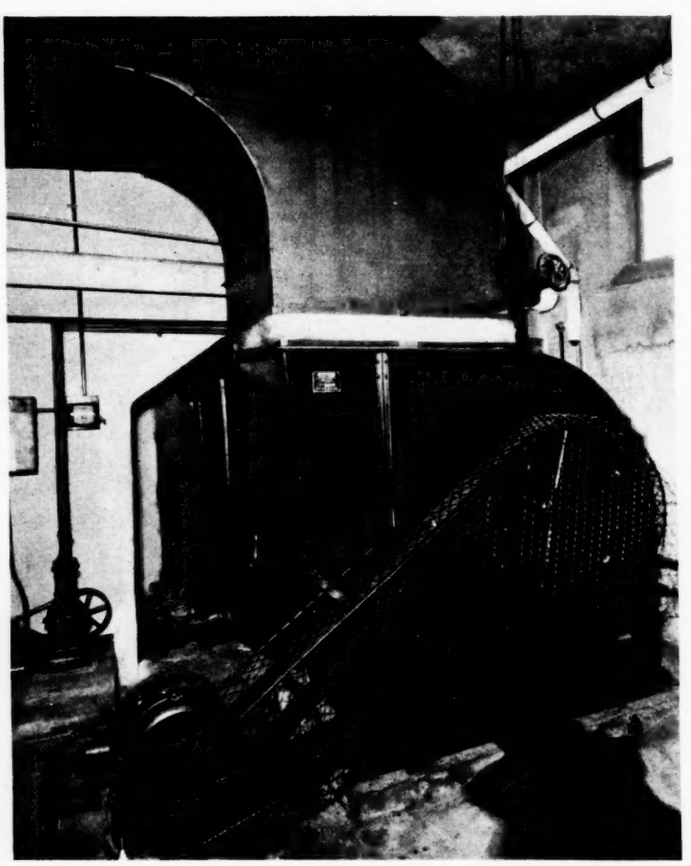
By L. GWATHMEY† and B. S. WEAVER‡

SINCE some important sections in many large cities are served by direct current systems, it seems worth while to point out some of the problems encountered when air conditioning installations are contemplated in these districts. Most large-production apparatus is arranged for alternating current drive, and to change the apparatus itself may involve heavy expense in the redesign of motor and control. For direct current drives, there are the problems of obtaining constant speed, adequate motor enclosures and protection, and of eliminating commutator noise and radio interference.

As regards the control, the electrical timing feature is forfeited, and spring-driven clocks (electrically or manually wound) replace the all-electric clocks. Since the means of voltage transformation is lost, thermostats and other controls must be designed for use at the voltage of the power circuit, usually 115 volts line-to-ground. Although the voltage across the contacts of such devices may be reduced by operating them in parallel with a section of a resistor connected across the line, the possibility exists that the contacts may operate with full line voltage. Hence, such circuits are considered as high-voltage circuits, that is in so far as regards insulation and wiring standards required.

If conversion equipment is used to generate alternating current for equipment which is normally furnished with a built-in alternating current motor, it is generally advisable to arrange the control so that the conversion equipment runs only when operation of the air conditioning machine is called for. For equipment such as oil burners, using only 100 to 250 watts, the no-load losses of a converter or motor-generator set, if operated continuously, might represent more energy than the normal energy use of the oil burner motor itself.

Design of a converter or motor-generator to supply alternating current to a single unit is one which requires careful study. To reduce the conversion losses, the converter should be as small as possible. However, it must be large enough to start and accelerate the alternating current motor. Since the starting inrush of small alternating current motors may be six to seven times normal, the conversion equipment must maintain nearly normal voltage at this high output, and also operate at normal output without generating an excessive voltage. To meet these conflicting requirements, conversion equipment must be electrically oversize for the normal load condition, even though field forcing of the alternating current generator be used to maintain voltage while starting the load. If the load involves an induction motor of normally low rotor resistance, best starting performance may be obtained by bringing the motor, the load, and the conversion equipment up to speed together, with the motor and load starting at reduced voltage and frequency. In the many devices where direct and alternating current motors may be used interchangeably, this phase of the problem is avoided. However, in hermetically-sealed compressors, oil burners with built-in motors and similar applications, where motors without commutators or brushes may be necessary, the choice of conversion equipment involves these problems. If several load units can be operated from a single converter and the number of units in operation is reasonably constant, the selection of the conversion equipment is simplified.



American Blower Co.

High-speed induction motor belted to a low-speed fan

Radio Interference: Radio interference may be the result of direct radiation or of electrical impulses transmitted from a motor through the power lines to a receiving set on the same circuit. Obviously, the latter case applies principally to the smaller motors, which may be installed on a lighting circuit. Where the transmission is of this type, filters can be applied, consisting of capacitors connected across the line, with mid-point grounded. Since a "commutator ripple" sets up a relatively high frequency, the pulsations may be

†Air Conditioning Department, General Electric Co.
‡Industrial Engineering Department, General Electric Co.

absorbed by a capacitor of surprisingly small rating. Where the radiation is direct, a metal enclosure will prevent the transmission of the radiation.

Allowable Noise Levels: Motor noise, if it is of appreciable intensity, is apt to be very penetrating, since either the magnetic or the windage noises of high-speed motors are of relatively high frequency. Although noise can be muffled to a degree by enclosures in air conditioning applications, it is often transmitted by air supply ducts. Since magnetic noise results from vibration caused by flux pulsations, motors may be designed with rotor and stator slot combinations which reduce these pulsations to a low value. Thus the magnetic hum may be largely eliminated, and the windage noise of the motor may be reduced by proper direction of the air flow through the motor. With quiet operating motors and by use of enclosures for the larger units, it is usually possible to reduce motor noise to an acceptable level, which in quiet homes may be as low as 25 loudness units in the living quarters, and at this level, the noise of the driven machines is apt to be above that of the motor.

Preventing Transmission of Vibration: Equally important is the problem of isolating any vibration in motors and driven machines, since resonance in some part of the building structure may otherwise develop. Vibration can best be isolated by supporting the machine on a flexible mounting which has a natural frequency of one-fourth to one-sixth the frequency of the disturbing impulses. With the larger, low-speed equipment, the design of a suitably flexible mounting may offer difficulties, particularly where piping connections to the machinery must be made. However, for the smaller motors of relatively high speed, which constitute the majority of the domestic applications, mountings of suitable flexibility are easily made.

What Are Ions?

As air conditioning advances it is becoming increasingly evident that other, and more subtle, atmospheric influences than simply temperature and humidity relationships affect the physiological processes and the problem of securing good air conditions. It is a well-known fact that by mechanical means, the climatological conditions of a perfect spring day can be exactly imitated indoors regardless of the season, so far as can be indicated by the wet and dry-bulb thermometer. In spite of this there is reason to doubt that these artificial conditions, however perfect, are capable of producing physiological reactions comparable to those experienced during one of nature's invigorating spring mornings.

In searching for these less obvious influences, indications have been uncovered which have caused physicians and scientists to suspect ionization of the air as being a possible cause. This naturally leads to the question "What is ionization and what are ions?"

Ionization, as applied to air, is simply an indication of the electrostatic condition of the air. Normally, the minute physical systems or molecules of which the gases of the air are composed are electrostatically neutral. When these molecules, for one reason or another, become charged with negative or positive static electricity, they become ions, and are referred to as the "small" ions of the atmosphere.

The small ions are formed when certain types of radiation strike the molecules of the air. The energy of the radiation separates the positive and negative electricity in a neutral molecule of air, thus forming a pair of oppositely charged small ions. These radiations emanate principally from radio-active substances in the soil and the air, although an appreciable portion is attributable to the little-understood cosmic rays.

Atmospheric air, especially that in the neighborhood of densely populated areas, carries in suspension at all times minute particles of solid matter called condensation nuclei. These condensation nuclei, so called because atmospheric moisture condenses upon them to form rain drops, originate from smoke from chimneys, exhaust gases of internal combustion engines, exhaled air from the lungs of animals, and a number of other sources. Normally, these nuclei are neutral electrostatically, but when a small ion makes contact with one of them, as it frequently does, the small ion gives up its charge to the larger particle of solid material, and it becomes a "large" ion of the atmosphere.

This process goes on continuously in both directions, for when a positively charged small or large ion makes contact with a negatively charged small or large ion, the charges of opposite polarity balance, and the ion no longer exists. In other words, ions are constantly coming into being in the atmosphere, and are constantly being neutralized or removed by combining with ions of opposite polarity.

In suburban Washington, D. C., the location of the Carnegie Institution of Washington, where intensive research into this subject has been carried out, the ionic density per cubic centimeter of atmospheric air averages approximately 200 small ions, and normally about 6000 large ions. The number of ions in the air is found to be a maximum in the early morning and a minimum in the late afternoon. These regular and systematic daily variations in the number of ions take place at all places, but the variations for one locality are not usually identical with those in another.

YOUR EVERYDAY PROBLEMS

Letters to HEATING AND VENTILATING regarding your problems on installation and operation of heating and ventilating systems will be answered promptly and, in some cases, published anonymously.

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QUESTION 112. *What are the chemical constituents of the "NS" fluid, the high temperature heating medium mentioned in the December issue of your magazine? Also, what are its physical properties, and where may it be obtained?* *J. H. L.*

ANSWER. "NS" fluid, the invention of Ernst Sander, Berlin, Germany, consists of anhydrous aluminum chloride, sodium chloride, and iron chloride, mixed approximately in the proportions of 6 : 3 : 1. This mixture softens at approximately 250°, becomes fluid at approximately 300°, and remains a liquid up to approximately 1830°, at which temperature evaporation commences. It must be confined in a closed system in use, in order to exclude all moisture.

This material, which is patented, may be obtained from the Consolidirte Alkaliwerke, Westeregeln, Germany. Complete information concerning it may be obtained from Prof. Theodor Kayser, Technische Hochschule Berlin, Charlottenburg, Germany.

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QUESTION 113. *We are operating a multiblade fan at approximately* 1125 *r.p.m. to deliver about* 3200 *c.f.m. of air in a small church auditorium. It is desired to step up this delivered volume by about* 50%, *that is, to a volume in the neighborhood of* 4800 *c.f.m. At what rotative speed must the new motor drive the fan?* *J. H. Co.*

ANSWER: Discharge volume is directly proportional to the speed of rotation of the fan and therefore:

$$\frac{\text{r.p.m.}}{1125} = \frac{4800}{3200}$$

$$\text{r.p.m.} = 1687.5$$

Sixty-cycle alternating current motors revolving at speeds of 1740 r.p.m. are readily available.

●

QUESTION 114. *How deep should an* 8-*in. pipe carrying steam for heating be buried in order that the loss of heat will not be too great? The pipe is covered with insulating material.* *B. M. G.*

ANSWER. There is little to be gained by burying a pipe deeper than 2 ft. from the ground surface.

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QUESTION 115. *The writer is planning to erect a heating plant for a new building. It is probable that within a few years it will be necessary to provide steam for power as well as heating purposes. Would it be wise to install a high-pressure boiler now instead of a low-pressure heating boiler? Could such a boiler be operated economically at the low pressures required for heating, or would it be better to operate at, say* 200 *lb., and reduce the heating pressure?* *A. E. P.*

ANSWER. First cost of the power boiler would probably be higher than that of the low-pressure heating boiler, but the difference should not be so great as to rule it out.

Greater efficiency should be obtained by low-pressure operation of the power boiler, since the stack temperature and loss of heat from the boiler and lines would be less. Also, in most localities, a licensed operator is required for equipment operating at high pressures.

On the other hand, with high-pressure operation, steam would be available for feed pumps and auxiliaries. A low-pressure safety valve should be used when operating at low pressures without a reducing valve to protect the heating system, and it will be necessary to replace this with a high-pressure valve when operation is shifted to produce power. A reducing valve will also have to be purchased and installed eventually, so that there should be no ultimate saving in cost of equipment by low-pressure operation.

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QUESTION 116. *In a closed hot water heating system with the expansion tank in the basement, is it necessary to connect the tank to the top of more than one of the risers? Would it not be just as well to connect the tank to the return and thereby save space and pipefitting work?* *"Reader"*

ANSWER. The expansion tank of a closed hot water heating system should be connected to the system at the top of both of the risers from the boiler, never to a point in the return. This is because air and other gases carried in the water of the system are dissolved out in the boiler, where the temperature is highest, and are then conveyed to the closed tank where they serve the useful purpose of providing a compressed gas cushion. The relatively cold water of the return has a greater capacity for dissolved gases, and if the connection to the tank is made at the return to the boiler, the gases removed from the water in the boiler will rise into the system to be trapped in the radiators.

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QUESTION 117. *Is sulphur dioxide as used as a refrigerant corrosive to copper? I have had some direct expansion coils of this metal show considerable deterioration within the past year.* *J. E. F.*

ANSWER. Sulphur dioxide, when pure, has no corrosive effect on copper or its alloys, zinc, or iron. However, if water is present in the vapor, sulphurous acid is formed, and this does have some injurious effects on these materials. It is probable that moisture is present in the system you describe and should be removed.

Abstracts . . .

Reviews and Summaries of. . . . Current Papers, Books and Pamphlets

How Old is Air Conditioning?

An engineering editor turns his attention to a historical account of the origin of air conditioning, with entertaining results, if not particularly valuable in a purely technological sense. The author, with little regard for chronological unity, skips lightly between the Neolithic man, medieval Europe, ancient Chinese civilization, and the Great Britain of Victoria, to present examples of the earliest attempts to improve upon nature's weather. One of the illustrations depicts an air washer performing all the functions of imparting air motion, temperature and humidity control, and filtration, first published in 1873. This apparently dates air conditioning as being at least 61 years old.

[*"The Origins of Air Conditioning," by David L. Fiske, "Refrigerating Engineering," New York, March,* 1934. *Approximately* 2000 *words; nine illustrations; bibliography.*]

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Measuring and Controlling Humidity

A comprehensive discussion of the various methods for humidity measurement and control finding practical application is contained in the revised and amplified edition of the report of the Engineering Committee of the Food Investigation Board of the British Department of Scientific and Industrial Research, London, originally issued in 1925.

Included in the methods for controlling the relative humidity in enclosed spaces are the water spray method, calcium chloride method, sulphuric acid method, Lindley's method utilizing revolving plates saturated with sulphuric acid, and construction and manipulation of an enclosure for the calibration of hygrometers. The principles underlying the water spray method are discussed in some detail, and this section contains a description of the application of this principle to the design of a kiln for drying timber in the laboratory.

Concerning the measurement of humidity, the report establishes the chemical method as the ultimate standard of reference. This is accomplished by the determination of the increase of weight of a quantity of moisture-absorbent material when a measured quantity of air is aspirated through it. An improved hygrometer designed by Rideal and Hannah, which applies this principle to the hygrometric measurements and eliminates the inaccuracies and tedious labor formerly involved in these determinations, is described.

The three common types of hygrometer are then taken up in considerable detail, with descriptions of all the important forms and variations in which these principles are applied. These include the general classifications of wet and dry bulb, hygrometers of the ventilated type, the dewpoint hygrometer, and the hair hygrometers.

Concluding sections deal with apparatus for the study of the changes of length of materials subjected to a cycle of humidities, a hygrometer employing glycerine, the effect of humidity on the relative mobility of ions, a fog-formation hygrometer, the hot-wire hygrometer, and the measurement of humidity up to a temperature of 212°.

[*"The Measurement of Humidity in Closed Spaces," Revised Edition,* 1933. *Special Report No.* 8 *of the Department of Scientific and Industrial Research, London; published by His Majesty's Stationery Office, London;* 70 *pages; illustrated; bibliography. Obtainable from The British Library of Information,* 270 *Madison Ave., New York; price,* 50 *cents.*]

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The 1934 Guide

The A.S.H.V.E. *Guide* for 1934 has appeared, new in typography and text arrangement, and containing much new and revised technical data. A more logical order of presentation of the material, together with a more complete indexing, should increase the value of the work as a textbook.

Air conditioning theory and standards, formerly deferred until later chapters, are covered in the first three chapters of the 12th edition. Having established the fundamentals and principles of the whole subject, the *Guide* then proceeds to discuss the details of the various phases. The section on heat transfer contains a table of conductances of air spaces bounded by aluminum foil not included before, and the chapter on computing the heating load includes a chart for determining the thickness of insulation required to prevent condensation on building surfaces.

A new chapter on computing the cooling load contains a fund of information valuable in designing cooling equipment, including a table of design wet and dry-bulb temperatures, wind velocities, and prevailing summer wind directions for 65 cities, a table of heat equivalents of various mechanical and electrical devices, and curves showing solar intensity on horizontal surfaces and on walls.

Chapters on fuels and combustion have been combined and largely rewritten, and other new chapters include those on air pollution, unit conditioners, industrial exhaust systems, electrical heating, water supply piping, and test methods and instruments.

[*A.S.H.V.E. Guide* 1934, *published by American Society of Heating and Ventilating Engineers,* 51 *Madison Ave., New York. Flexible imitation leather cover;* 6 *in.* × 9 *in.;* 846 *pages;* $5.]

EDITORIALS

Permanent Fair Practices

NRA codes covering the manufacture and distribution of heating and ventilating equipment are in most cases now only reaching the state where the real work of compliance is to start. The past eight or nine months have been so largely given over to preparing these codes that the complaint is heard that executives have had to practically live in Washington. Now the specified emergency period is nearly half over. The act and all the machinery set up under it are supposed to pass out of existence in a little over a year. Here and there people say that many of our codes never will go into full effect as the emergency period will be over before they get going. Others feel that the codes and the whole idea behind them are impracticable and unworkable.

Regardless of opinions as to either the permanence of the codes, their desirability, or workability, one evident good is assured. Never before did so many people get together and talk over their troubles, air their views, and try to devise mutually acceptable rules covering trade practices. The result has been a pretty general clarification of thought regarding what is fair and what is unfair in the heating and ventilating business. At least the problem is clearer if the solution is not yet accomplished or even indicated. It is commonly said that a clear understanding of a problem is essential to its solution. We believe this clarification will stand as a permanent good even if the machinery for solution is changed. It is doubtful if many will want to return to old methods after they have considered so thoroughly what is wrong with them.

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Money for Modernizing

MODERNIZATION of the heating and ventilating plants in buildings is a subject which has come more and more strongly to the front ever since the rate of activity in erecting new buildings began to slow down. Much has been said and written about it. Plans for accomplishing it have been prepared, distributed, and publicized. Campaigns have been organized and launched.

One result of all the activity has been that the fact of the importance of modernization as a potential source of business is now well established. Practically every existing building can stand some modernizing of its plant.

In view of the effort expended to promote modernizing it is apparent that powerful forces must be operating to hold it back. It is not difficult to enumerate some of them. In the first place the whole idea is still comparatively new and time is necessary for absorption to take place. Also, it involves selling and promotion methods peculiar to itself. Then, too, there is no great body of experience to draw on. On top of these, and probably the most important, is the difficulty of privately financing almost anything which has to do with real estate or improvements to real estate. The simple truth is that private investment money does not look at buildings or their equipment as a desirable field. Factual data bearing on this lack of suitable financing come from a variety of directions, and prompt the conclusion that it is the most important force holding back modernizing work in buildings.

Accepting this present situation and granting that there is nothing on the immediate horizon which would lead to expecting a change in attitude there seems to be abundant reason for urging that public money be made available on suitable terms.

As a means of stimulating the present use of capital goods which in the past have gone into new building construction it is hard to see how a more practical way could be found than for the government to adopt a definite policy of furthering modernizing. Adoption of such a policy should carry with it a liberal plan for using government credit to make the policy effective at once.

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Smaller Jobs for Cooling

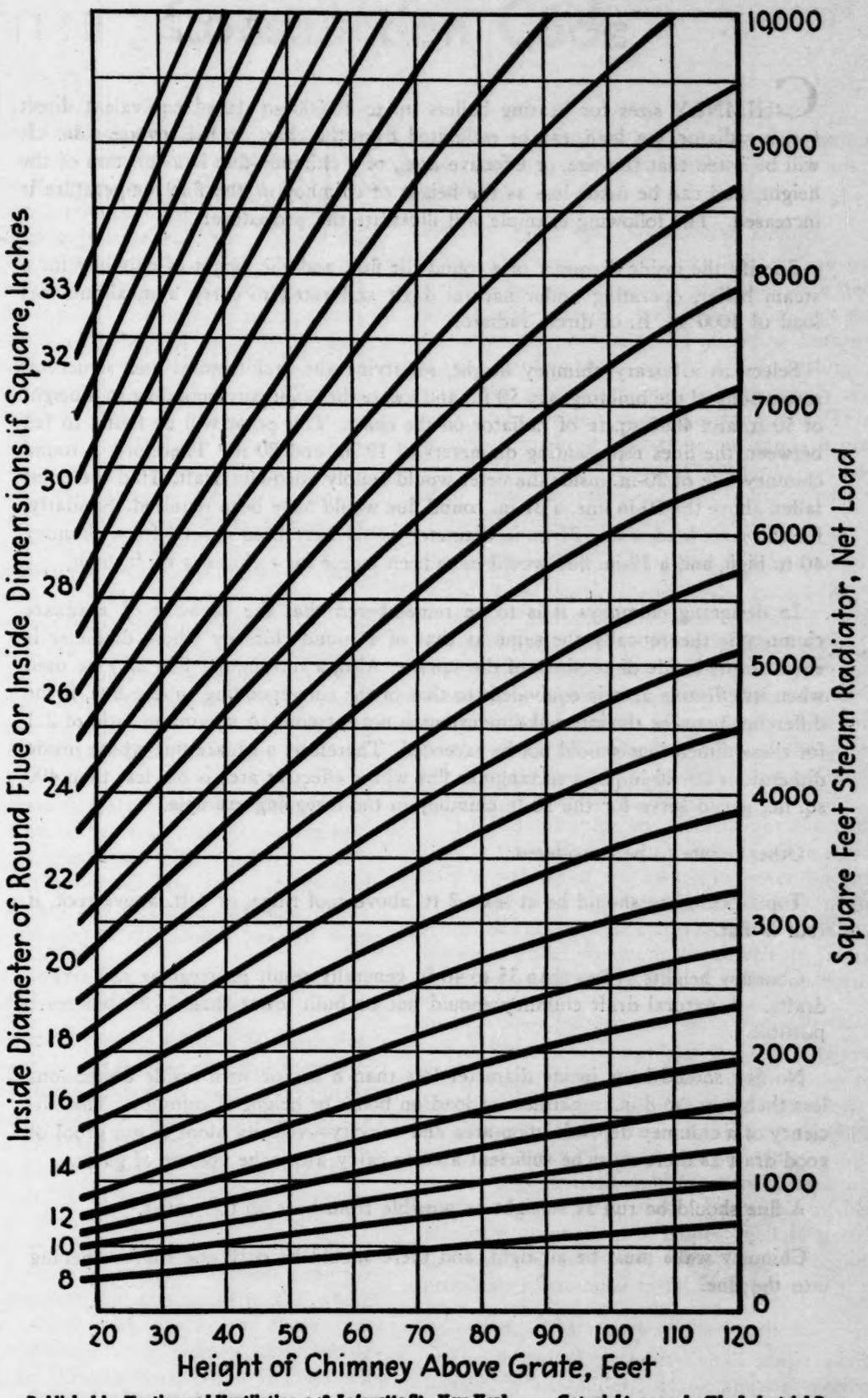
THERE has been a good deal of speculation as to the progress made by air conditioning to date, and especially of the use of cooling in these installations. Several months ago, HEATING AND VENTILATING estimated that approximately 3000 buildings contained air-cooling equipment at the close of last summer. A later survey among prominent utility companies tends to indicate that this estimate is substantially correct. It also brings out clearly that the average installation made last year was very much smaller than those made during previous years.

It is too early to decide whether this decrease in size of the average installation is the beginning of a permanent trend or whether it was peculiar to last year's abnormal business and financial situation. There is no doubt but that the advent of the cabinet conditioner had much to do with this decrease in the size of installation, for this kind of unit was put into many of the installations made last year. It fitted admirably into the requirements of much of the work which could be accomplished when unit sales and installations had to be small. Many jobs which might under happier circumstances use large numbers of units had to get along with only a small number last year. It is doubtful if too much meaning should be attached to the figures.

To some it is doubtless hard to believe that the number of buildings with cooling is so small. There is nothing surprising about this, however. Neither is there any cause for discouragement. Early progress in obtaining acceptance of a new idea is always slow, and the small number does not mean a correspondingly small space cooled. Many of the 3000 installations are large and extensive.

SIZING NATURAL DRAFT CHIMNEYS

(Explanation on reverse side)



Published by Heating and Ventilating, 148 Lafayette St., New York *Copyright, 1934, by The Industrial Press*

H & V's REFERENCE DATA—31

SIZING NATURAL DRAFT CHIMNEYS

CHIMNEY sizes for heating boilers up to 10,000 sq. ft. of equivalent direct steam radiator, net load, can be estimated from the chart on the reverse side. It will be noted that the size, or effective area, of a chimney flue is a function of the height, and can be made less as the height of chimney or the flue temperature is increased. The following example will illustrate the procedure:

Specify the inside diameter of a round tile flue, and the height of chimney for a steam boiler, operating under natural draft and rated to carry a maximum net load of 4000 sq. ft. of direct radiator.

Select an arbitrary chimney height, satisfying the architectural and structural restrictions of the building, say 50 ft., and locate the point corresponding to a height of 50 ft. and 4000 sq. ft. of radiator on the chart. This point will be found to fall between the lines representing diameters of 19 in. and 20 in. Therefore, a round chimney flue of 20-in. inside diameter would supply adequate draft. Had the point fallen above the 20-in line, a 21-in. round flue would have been required. Similarly, for the same load, a flue 21-in. in diameter would have been needed for a chimney 40 ft. high, and a 19-in. flue would have been ample for a chimney 60 ft. high.

In designing chimneys it is to be remembered that the capacity of a square chimney is theoretically the same as that of a round chimney whose diameter is equal to the inside dimensions of the square. Also, a rectangular flue may be used when its effective area is equivalent to that of the corresponding square flue, if the difference between the internal dimensions is not extreme. A maximum ratio of 2:1 for these dimensions should not be exceeded. Therefore, a square flue whose inside dimensions are 20-in., or a rectangular flue whose effective area is not less than 400 sq. in., would serve for the 50-ft. chimney in the foregoing example.

Other points to be considered:

Top of chimney should be at least 2 ft. above roof ridge, or 3 ft. above roof, if roof is flat.

Chimney heights of less than 35 to 40 ft. generally result in irregular and erratic drafts. A natural draft chimney should not be built lower than 35 ft. wherever possible.

No flue should have inside diameter less than 8 in., or with inside dimensions less than 8 in. $\times$ 8 in., regardless of load on boiler or height of chimney. The efficiency of a chimney depends upon area and velocity—velocity alone is not proof of good draft as there must be sufficient area to carry away the volume of gases.

A flue should be run as straight as possible from base to top outlet.

Chimney walls must be air-tight, and there should be only one smoke opening into the flue.

Planning and Adjusting Board Feature of Construction Code

PROLONGED discussions and disagreements over the Code for the Construction Industry† ended amicably when President Roosevelt gave his approval to the final draft of Chapter I (the basic code) on January 31. On March 2, the code became effective. The Code Authority, which is the top body in administration and whose acts will be vitally important, has been formed, with Stephen F. Voorhees as chairman. The representative for the Heating, Piping and Air Conditioning Contractors National Association is Robert D. Williams, of New York, while the American Society of Civil Engineers is represented by John P. Hogan. Approval has not yet been given to most of the appended chapters, although prompt action is expected. Even now before the approval of the various sub-codes the master code is binding and effective on everyone engaged in construction. Every engineer and contractor may regard this code as stating the trade or business law under which he is required to operate.

Wage and labor provisions are set up on the basis of a minimum wage of 40 cents per hour for common labor, and minimum rates of from $12 to $15 per week for office and clerical help. Maximum working hours are 40 per week and eight per day. Persons under 16 years of age are not to be employed (under 18 if the work is hazardous).

One of the outstanding features of the code, and one wherein it differs from all others, is the setting up of a Planning and Adjustment Board with equal representation from labor and employers. This board is expected to plan for the industry and to adjust disputes. As we go to press the personnel of this Board has not been announced.

Competitive Bidding Practices

Article VII, which lays down rules of fair practice, is probably the most important one in the whole code, so far as its effects on the immediate work of engineers and contractors are concerned. Recall that each of the divisional codes is expected to either carry this identical Article or to refer to and endorse its wording. With this arrangement it is clear that here are the rules which will govern the letting of all contracts where there is competitive bidding. Sooner or later these rules will have to be known in great detail—almost word for word—by every engineer and contractor in the whole building industry. Note that you are an "awarding authority" every time you let a contract after asking for competitive bids. This is equally true if the work involved is in a new building or in alterations or modernization. So also do the rules govern the letting of sub-contracts as well as generals. HEATING AND VENTILATING is printing this section here in full for ready reference.

Section 1.—Competitive Bidding Defined.

(a) The term "competitive bidding" as used herein shall mean the submission at or before a definite predetermined time of comparable proposals by two or more invited persons to an awarding authority to execute a specific program of work, furnishing a definite service or supplying a material specifically required for a particular project at a stipulated price. This does not include furnishing quotations on standard products.

(b) The term "awarding authority" as used herein shall mean any member of the industry who may upon competitive bidding award contracts.

Section 2.—Bid Peddling and Bid Shopping.

(a) The practices commonly known as "bid peddling" or "bid shopping" are recognized as unfair and are prohibited. Bid peddling in effect means the offering by the bidder prior to the making of an award of a substitute bid or price lower than the one originally bid without a commensurate decrease in the requirements of the job. The correction of the abuses resulting from such practice is obtainable by regulation restricting or controlling bidders.

(b) Bid shopping in effect means the effort on the part of the awarding authority to induce a bidder prior to the making of the award to lower his original bid price without a commensurate decrease in the requirements of the job. The correction of the abuses resulting from such practice is obtainable by regulation restricting or controlling the awarding authority.

Section 3.—Limitation on Bids and Alternates.

(a) Since it is recognized that the preparation of a bid is a service involving an expense to the bidder and that the inviting of an unreasonable number of bids is an economic waste, the awarding authority shall not invite an unnecessary number of bids.

(b) Only a limited number of alternate proposals shall be required in connection with any bid, and no alternate proposal of a bidder shall be considered by the awarding authority, unless the privilege of alternate proposals is extended to all bidders.

Section 4.—Uniformity of Information.

The awarding authority shall make available uniformly to all bidders, plans and/or specifications or other requisite information which shall be sufficiently complete to enable each bidder to prepare a definite bid in accordance with the regulations herein provided for. He shall prescribe terms of competition which shall insure parity of standing to all bidders.

†For complete copies of Chapter 1 (the basic code) of the Construction Industry send to the Government Printing Office asking for Registry No. 1616-2-31, enclosing five cents. Address any question regarding code to HEATING AND VENTILATING.

Section 5.—Qualification of Bidders.

The awarding authority shall not invite bids from a bidder unless such bidder shall have demonstrated to the satisfaction of the awarding authority that he is competent technically and financially to perform the work, and the ability of a bidder to obtain a performance bond shall not be regarded as the sole test of such bidder's competency.

Section 6.—Award at Original Price.

An award if made shall be made at the bidder's original bid price. It is recognized that competition based solely on price is sometimes unfair and accordingly the awarding authority may make an award to a competitive bidder other than the lowest bidder, provided the award is made at such competitor's original bid price.

Section 7.—Receipt of Bids.

The awarding authority shall designate a specific hour and place for receiving competitive bids. All bids to be submitted by subcontractors shall be delivered to the contractor at least 24 hr. prior to the time set for the receipt of the bid of said contractor by the awarding authority. Bids received after such time or from uninvited bidders shall be returned unopened. All bids shall be required to be signed by a duly authorized representative of the bidder and enclosed in a sealed envelope on the outside of which shall appear its identification as a bid for the particular job.

Section 8.—No Influencing of Bidders.

The awarding authority shall not at any time prior to the specified time for the receipt of bids convey to any bidder information relating to the price or terms of any other bid in order to influence the price or terms of such bidder.

Section 9.—Collusion Prohibited.

There shall be no collusion between the awarding authority and any bidder, nor between the different bidders in the preparation of any bid. The awarding authority shall not use any bid which is so unduly low as to indicate an error or mistake in estimating without first giving the bidder the opportunity of demonstrating by cost sheets or other methods the correctness of the bid that he has submitted.

Section 10.—Time Limit on Awards.

The awarding authority shall make an award or reject all bids for the principal contract with the owner within 20 days after the stipulated time for the receiving of bids except where an extension of time has been requested from the bidders and has been consented to by two or more bidders. In the case of bids conditioned upon the award of a previous contract, each succeeding awarding authority shall make an award or reject all bids within 30 days after the award of such previous contract except as to such bidders as shall agree to an extension of time. The right to reject any or all bids may be reserved by the awarding authority, and such rejection shall be made in writing. Where all bids are rejected, bids shall not be again invited or submitted for the mere purpose of obtaining a lower or revised price or prices for substantially the same work previous to the elapse of 90 days from the date of such rejection, except there be a substantial change in the plans and/or specifications, or except there be evidence of collusion, or except there be such a marked difference between the bids submitted and the awarding authority's estimate as to the valuation of the work as would indicate to the awarding authority and his Code Authority the necessity of new bids in order to secure fair competition.

Section 11.—Naming of Subcontractors.

Before making an award the awarding authority may require any bidder to name the subcontractors whom such bidder intends to employ for the various divisions of the work bid upon.

Section 12.—Rebates, Refunds and Discounts.

The awarding authority shall not accept rebates, refunds, discounts, or other special allowances or services from a bidder unless included by the bidder in his original bid.

Section 13.—Owners' Compliance.

The various divisions and subdivisions of the industry may provide in the chapters specifically applicable to such divisions or subdivisions, that members of the division or subdivision shall not submit a competitive bid, as defined in Section 1 (a) of this Article, to an owner or any other person, corresponding to an awarding authority as herein defined unless such owner or other person agrees to comply with the regulations provided herein governing an awarding authority.

Section 14.—Checking Bids.

In order to enforce the practice of fair competitive bidding, the Divisional Code Authorities shall provide, if no such method is provided in the chapter applicable to such division, a method satisfactory to the Construction Code Authority for checking bids submitted by members of such division either by designating a depository for the filing of duplicate bids or by some other acceptable method. The Construction Code Authority may require such changes in any such method as may be necessary to prevent conflict between the various methods which may be adopted by the various Divisional Code Authorities.

So far as practical matters are concerned the bidding practice rules say—"Don't peddle and don't chisel, but let the contract on a basis fair to all the bidders."

A question which is repeatedly asked, although it has been answered repeatedly, is whether or not the code applies to people who do not belong to the trade association administering it. The answer is that supposedly the code does apply and must be followed regardless of membership. At least the safest procedure is to conform to the code unless you are prepared to defend an action to compel you to do so.

Approval of the code brought unusually strong statements both from the daily press and from leaders in the industry who hailed it as a definite gain.

One of the first actions taken by the Authority was to order registration with the Divisional Authority of all construction projects exceeding $2,000.

Many Codes Pass Approval Stage

CODES are now rapidly reaching the stage where writing and approval are largely finished, organization for compliance is the immediate objective. True, the large public meetings of early March and the resulting suggestions of a reduction in working hours in all industry together with no decrease in pay have attracted most attention in recent weeks. Underneath all this though, the work of approval and organization for administration has gone on. About 350 codes have been approved and virtually all industries employing large numbers are included in the list. In all these groups the work of administration is proceeding—varying from those whose Authorities are fully organized and working to those just starting their programs.

Manufacturing codes recently approved are those for the Fan and Blower Industry (effective February 12), Cast Iron Boiler and Radiator Industry (effective February 10), Steam Heating Equipment Industry (effective February 26), Unit Heater and Unit Ventilator (effective February 19), and Concealed Radiator (effective February 19).

On January 31 the long-awaited construction code received approval but did not become effective until March 2. These approvals and the progress made in organizing compliance are the principal events of direct interest in the code situation within recent weeks. Manufacturing codes still awaiting approval include Extended Surface, Air Filters, and Stokers. Hearings have been held on all of these but final approval is still withheld.

General Johnson announced approval of the membership of the Authority for the Warm Air Furnace Manufacturing Industry on February 23. Its membership consists of W. L. McGrath, C. Ackerson, Dana W. Norris, H. T. Richardson, Arthur Frazee, F. E. Mehrings, and C. A. Olsen.

The Oil Burner Authority is progressing rapidly and announcement was made on March 7 at the annual convention of the American Oil Burner Association that the work has progressed to the point where the uniform cost accounting system has received administration approval. As soon as copies of this system are distributed its immediate use is expected. Morgan J. Hammers also reported disposition of upward of 400 complaints and expressed gratification at the ready cooperation received from both manufacturers and dealers in the efforts of the Authority to administer the code.

As the trade practice rules set up in the manufacturing codes govern quotations, prices, and similar points which must necessarily affect engineers and contractors, those of especial interest are summarized here and given verbatim in certain cases.

Steam Heating Equipment Trade Practices

The approved code of the Steam Heating Equipment Industry (covering heating specialties) contains a series of 20 trade practice rules. Sales are to be by written, checkable, correctly-priced quotations containing change of price reservation and 60-day limitation. An open-price system is set up with required filing or full information on prices, terms, and conditions of sale, and likewise of price changes. Marking and branding are recognized and removal or alteration of such marks are listed as unfair. Rule 7 covering blanket orders is of interest, providing:

"It shall be deemed an unfair trade practice to accept blanket orders; therefore, all quotations and orders must specify an itemized bill of goods. If, after a quotation has been made, the specified requirements are changed, a new quotation shall be issued based upon published prices prevailing at that time. If, after an order has been accepted the requirements are changed, deductions shall be credited on the basis of prices prevailing at the time order was placed and additions shall be charged at the price prevailing at the time additions are made."

Cost fixing, through a standardized accounting procedure, is called for and sale or exchange at less than cost is prohibited with the usual reservation to permit disposal of dropped lines and seconds.

Regarding guarantees, Rule 13 states that: "No member of the Industry shall sell his product subject to a guarantee more favorable to the purchaser than the following: (a) No guarantee to furnish parts to replace defective material or workmanship shall extend beyond one year from date of shipment. (b) Replacements of defective material shall be f.o.b. manufacturer's factory subject to manufacturer's inspection. (c) Foreign component part equipment guarantee shall be limited to the warranty of its manufacturer."

Furnishing of free plans and specifications to contractors by steam heating specialty manufacturers has long been a source of friction between some of them and practicing engineers. Rule 14 covers this and reads as follows:

"The members of the Industry hereby agree that it shall constitute unfair trade practice for any member, or any employee to furnish heating plans and/or specifications to architects or others, unless such plans or service shall be charged for as set forth by the Code Authority, provided, that nothing in this rule shall limit the right of members of this Industry to furnish catalogs, dimensioned sketches, application drawings and the usual trade or advisory information concerning the products of the Industry and their application and use to Architects, Engineers, Contractors, and others, either for general or specific cases."

Boiler and Radiator Trade Rules

Open prices are also the rule here. Full lists must be filed with the secretary of the Institute and must in-

clude all prices, terms, discounts, allowances, or conditions. Sale to any purchaser at any more favorable terms or lower prices than those filed is an unfair practice. Price changes must also be filed but, unlike many codes, this one provides that such changes are effective immediately upon filing.

The code defines and recognizes two classes of wholesalers; also contractors, mail order houses, and direct-to-you houses. Wholesalers are divided into those who do not stock and those who purchase in carload lots. Contractors are set up as installers of equipment which they sell to consumers. Governmental bodies are classed as contractors and will be quoted the same prices and terms as contractors. Under this code the only difference between a mail order house and a direct-to-you is that the one operates nationally while the other does not.

Fan and Blower Rules

This code provides for a cost accounting system to govern uniform accounting practice and then bases its pricing on the cost of production as found by such accounting. Selling below this cost is prohibited except that "any member of the industry may meet the price competition of any other member who is not violating this code on products of equivalent design, size, capacity, character, quality, or specification." Full and fair invoicing is called for. The maximum guarantee period for defects of workmanship and material on standard products is fixed at one year. Sale of dropped lines of merchandise may be at prices necessary to move them, provided the amount of merchandise and the prices asked are registered with the code authority. Representation as to performance is to be in accordance with the test code adopted by the National Fan Manufacturers Association and the A.S.H.V.E.

Unit Heaters and Unit Ventilators

As written, this code provided for a system of open prices posted with the code authority and that a period of 10 days must elapse before changes to such posted prices should go into effect. In the order approving the code, however, operation of the 10-day clause was stayed pending the results of a study of open-price associations to be conducted by N.R.A.

The code recognizes four distinct trade groups, viz.: Consumers, Contractors, Jobbers, and Distributors. Jobbers and distributors as defined in this code perform a like function but differ in their contract relations with the manufacturer. The definition of the contractor in this code is different from those in most others, thus, the "Contractor is one who is regularly engaged in the business of installing heating systems and equipment, including unit heaters or unit ventilators, for the purpose of resale at a profit. A consumer who employs an erecting crew for installing heating materials or equipment on his own properties or for his own use shall not be classed as a contractor. Federal, State, County, and Municipal purchasers, including subdivisions thereof of such as School Boards, Park Commissions, and the like, may be classified as Contractors."

Pricing to these trade groups is covered by the following provisions: "Nothing herein contained shall be construed to prevent a member of the Industry from selecting his own customers and the classes of customers through whom he wishes to market his goods, but it is deemed conducive to unfair methods of competition to discriminate between purchasers of the same class, or to discriminate between the several recognized classes of purchasers on other than a uniform basis except in the case of distributors or agents. To effectuate this policy:

"(a) The heating contractor, as the commonly recognized dealer in this class of materials, may be extended a trade discount, provided the member extending the discount issues a published price sheet to contractors showing said discount and extends the same discount to all contractors with whom he does business.

"(b) The jobber, who in turn serves the heating contractor, may be extended the contractor's trade discount plus an additional trade discount of not to exceed 10%, provided the member extending said discount issues a published price sheet to jobbers showing said discounts and extends the same discounts to all jobbers with whom he does business.

"(c) The distributor or agent, under contract to abide by the prices and terms of sale of the published price sheet and these Rules of Fair Competition may be extended any discount which a member elects to extend."

Trade discounts for quantity purchasing are recognized as allowable under specific circumstances; written quotations or bills of sale are called for, with price change reservations and a 60-day clause. Performance is to be based on the test codes of the A.S.H.V.E. Blanket orders are ruled out and quotations must specify an itemized bill of goods. Uniform cost accounting is provided for, and selling any but close-outs and dropped lines, etc., at less than cost is prohibited. Cash discounts up to 30 days are permissible if such discounts are computed as a part of collection costs.

The trade practice rules of the code are unusually lengthy and detailed.

Concealed Radiators

The trade rules set up in this code resemble closely those of the unit heater and ventilator code. No provision for a 10-day waiting period after filing of price is present in the approved code, however. Only three classes of the trade are recognized, viz.: Contractors, Jobbers, and Distributors. Consumers are not listed as a trade group.

The Institute Proposal

A basic manufacturing code for heating and air conditioning still remains as a possibility. Consideration of this proposal has been delayed because of illness of the chairman of the committee appointed to determine the feeling of manufacturers regarding it.

BUSINESS BRIEFS

GENERAL business picked up in February from the January level, and at the time of this writing March business continues about the same rate as February. Business in the heating industry in January increased from December and indications are that February figures will be somewhat higher than the January levels.

Building contract figures for February are disappointing and show a sharp drop from those of January. The most severe drop in February building was in the educational building group which dropped off from $19 million in January to $5 million in February.

January oil burner shipments were slightly lower than in December, but were still considerably above January a year ago. Air washer sales in February reached a new low level, but industrial air conditioning units fell off slightly from January. February blower sales were over half those of a year ago, while industrial unit heater sales were about two and one-half times as great in February as in February, 1933. Unit ventilator sales in February were up a third from January, but indications are that they should jump still more in March.

Cast-iron indirect heating surface sales in January were almost double those of December and those of the previous January. Stoker sales were off in January, but there is usually a seasonal decline in this month, and sales are running approximately double those of January a year ago. Little improvement has been shown in the steel heating boiler trade, but cast-iron round boilers and radiators are running well above a year ago, as are non-ferrous convection radiators. Cast-iron convector sales in February were up tremendously from a year ago. Non-ferrous convector heating elements showed a gain from last year, but the units sold in combination with cabinets and grilles showed a loss.

Prices in the industry during January maintained about the same level as the previous month, although building materials as a whole showed a slight increase.

Employment in plants making heating equipment increased slightly in February from the January level.

A MOVE by the Boston Chamber of Commerce may affect the competitive fuel situation in that city. The Chamber opposed a cut in freight rates for anthracite asked for by a leading hard coal carrier. The opposition was based on the fact that a concession in anthracite rates to certain New England points about a year ago was not passed on to the consumer, but was retained by the merchants. Fearing that another reduction would only hurt the New England railroads without benefiting the coal buyers, the Chamber placed itself on record against the cut.

$2.4 MILLION is needed to put the 5000 farm homes in Dallas County, Texas, in shape, and of this, $57,000 would be required for heating plant repairs, according to a report submitted by J. B. Danna, Dallas, supervisor of the CWA housing survey.

ARCHITECTS and engineers in Pennsylvania are busy modernizing hospitals and institutions throughout the state. These include alterations to the Norristown State Hospital, two new pavilions at the Harrisburg State Hospital, and a new convalescent building at the Allentown State Hospital. Two new dormitories are being planned for the State Sanatorium for Tuberculosis at Mt. Alto. Plans are also under way for an addition to the Scranton State Hospital, Nanticoke State Hospital, and for a pathological building at the Danville State Hospital.

AIR conditioning and cove lighting will be features of the Stineway Drug Company's first loop store, to be located in the new Field building Chicago. This will be the 14th unit in this company's chain of drug stores.

THE WOODROW WILSON High School contract awarded in District of Columbia at $1 million heads the large awards of the week ending March 17.

ONE of the conditions of any loan from the Home Owners Loan Corporation is that the home must be in sound condition at the time the refinancing takes place. Therefore, the amount necessary to be paid by the corporation for repairs, if any, plus the other expenses and the amount of the loan itself, must fall within the percentage of the appraisal value which the corporation is authorized to loan. That is, there must be a sufficient margin to pay for the essential repairs. Otherwise the indebtedness on the home cannot be refinanced by the HOLC.

Reconditioning may include repairs to a roof or, if necessary, a new roof on the house, and may include repairs to porches, but may not include additional porches. Repairs to the heating or plumbing or electrical equipment may be included to restore the house and make it tenantable as before, but not a new heating plant or new plumbing or new wiring when the house was not equipped with such before.

GENERAL HUGH S. JOHNSON has announced the appointment of Ralph S. Smith, secretary of Bloomer Brothers Company, paper box manufacturers of Newark, N. J., as administration member on the code authority for the warm-air furnace manufacturing industry.

Mr. Smith succeeds Deputy Administrator Beverly S. King, who has resigned pursuant to the policy of relieving NRA officials of code authority duties whenever possible.

THE Renovize Exposition, held in Cleveland during March atop the Builders Exchange Building, was

INDEX NUMBERS (1929=100)
120
110
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90
80
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60
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10
Heating and Ventilating
INDEX OF HEATING BUSINESS
ADJUSTED FOR SEASONAL VARIATION
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1929
1930
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1932
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1934

JANUARY HEATING BUSINESS UP

Advances in most of the component series of HEATING AND VENTILATING'S seasonally adjusted Index of Heating Business resulted in the January figures rising to 35.3† from 31.7* in December. Our Index of Automatic Heating reached an all-time low in December of 44.6. The previous low was 44.8 in April, 1933.

†Preliminary.
*Revised.

among the largest displays of its kind ever held. It was visited by several thousand present and prospective homeowners.

An index of the size of the heating and ventilating industry is given by a recent report on total wages paid to heating and ventilating contractors' employes in Ohio. Figures follow:

1918	$ 500,136
1919	360,399
1920	894,915
1921	710,721
1922	No Data
1923	933,209
1924	1,110,257
1925	1,358,086
1926	1,909,400
1927	1,842,197
1928	1,751,694
1929	2,427,562
1930	1,944,991
1931	1,424,202
1932	570,668

There was a 27.8% increase in the number of gas house-heating customers on the lines of manufactured gas companies in December, 1933, over those in December, 1932.

There is considerable interest in modernizing in Great Britain as well as in U. S. The Committee on Housing of the Ministry of Health of Great Britain, appointed in March, 1933, to consider the modernization of existing houses, recommended recently that local authorities be authorized to acquire and recondition houses not now fit for occupancy but which can be given a life of 20 years. This would be done through public utility societies, with funds loaned by the Treasury. It also urges advances to such societies to provide new housing and a subsidy on the new housing meeting certain conditions as to rents charged, kind of housing provided, etc. The whole scheme should be supervised by a central public utility council, consisting of not more than five members, to be appointed by the Minister.

The (weighted) average factory price of power oil burners, as of February 1, 1934, was $141.53, according to Morgan J. Hammers, chairman of the Oil Burner Code Authority. The average installed price for power burners at that date was $334.31.

Because of high real estate costs and the interest and amortization rates called for by Washington, it will be virtually impossible for the Municipal Housing Authority to build housing as low as $6 a room, the rate needed to meet the requirements of low-income groups, Dr. Carol Aronovici, lecturer on housing at Columbia University, declared March 10. Doctor Aronovici is director of the Columbia University Housing Orientation Study being conducted in cooperation with the CWA as a basis for slum clearance and low-cost housing schemes in the city.

There was an increase of 9.7% in number, and a decrease of 39.6% in cost, of new residential buildings erected in January as compared with December, according to the Bureau of Labor Statistics. The number of new non-residential buildings increased 14.6%.

W. L. Conwell, president, Safety Car Heating and Lighting Company, has been elected a director of Carrier Corporation. Mr. Conwell's company distributes Carrier railway car air conditioning systems.

Heating elements for convectors sold without cabinets or grilles in January totaled 126,171 sq. ft. as compared with 70,112 sq. ft. in January, 1933, and 95,047 in December. Elements sold with cabinets declined in January to 62,254 sq. ft. from 95,590 the previous month and 97,961 in January, 1933.

J. J. Donovan, manager of General Electric's Air Conditioning Department, has been made chairman of the Oil Burner and Air Conditioning Division Committee of the National Electrical and Radio Exposition, to be held at Madison Square Garden, New York, September 19-29.

Mortgages on 103,302 homes were refinanced up to March 10 by loans through the Home Owners Loan Corporation. 99.2% of this total was effected by exchange of the 4% bonds of the corporation for existing mortgages.

Preliminary plans for three St. Louis schools, to cost $1.2 million, have been made public.

The editor of "The Heating & Ventilating Engineer" (London) points out that "Tired folk are not buyers." He claims that exhibitions are unusually tiring, and that at the average exhibition the management fails to provide suitable seating accommodation where the visitors may rest.

In this country, exhibitors usually provide chairs, but it is quite possible that many visitors hesitate to use these accommodations if they are unknown to those at the booth.

WHAT is believed to be the first instance of an oil burner being given as a prize was reported from Baltimore recently, where a church society presented the winner of a contest with a Fluid Heat oil burner installation.

USE of the proceeds of approximately $1,764,800, to be raised by the Universal Pipe & Radiator Company through the issue of additional stock, includes payment of first mortgage bonds of the Central Foundry Company.

BUSINESS indications throughout the country and the splendid upturn in household and commercial refrigeration sales during the first 60 days of 1934 resulted, on March 1, in the Frigidaire Division of General Motors Corporation placing commitments with suppliers in various sections of the country for more than $2 million in raw materials and fabricated parts.

REGISTRATION of securities under the Securities Act of 1933 was made March 1 by Wonder Heater Co., Niantic, Ill., a Delaware corporation proposing to manufacture heating stoves, hot water equipment, and the like. The company expects to issue $250,000 common stock, the proceeds to be used for organization expenses. The underwriters are Miller-Murry & Company, Inc., New York. Among officers are: V. O. Jones, president, W. C. Jones, vice-president and treasurer, and Marie K. Jones, assistant secretary, all of Niantic, and Charles E. Pullen, Decatur, Ill., secretary.

MORE than half of the total number of Spencer boilers sold are for replacement jobs, according to C. N. Tull, president of the Spencer Heater Company. Mr. Tull believes that if heating contractors make a special effort to go after this kind of work, 1934 will be a very successful year.

A COTTAGE can be insulated with aluminum sheeting for $20, a mansion for $200, according to R. S. Reynolds, president of Reynolds Metals Company, Inc.

Annual Reports

AMERICAN RADIATOR AND STANDARD SANITARY CORPORATION and subsidiary and affiliated companies had a net loss of $881,575 in 1933. The 1932 loss was $5,990,986. Gross sales in 1933 were $67,972,674, against $61,295,560 in 1932.

CARRIER CORPORATION reports for 1933 a net loss after charges of $673,616, against $396,493 loss in 1932.

JAMES B. CLOW & SONS and subsidiaries report a net loss for 1933 of $2,979, against a 1932 loss of $672,996.

GENERAL ELECTRIC COMPANY in 1933 had a net income of $13,429,739, against $14,404,110 in 1932. Sales billed were $136.6 million in 1933, $147.2 million in 1932.

HERMAN NELSON Corporation—For 1933: Net loss after depreciation, provision for doubtful accounts, contingencies and other charges, $178,436, compared with $82,993 loss the year before.

JOHNS-MANVILLE Corporation reports for 1933 a net income of $105,331 as compared with a net loss of $2,680,873 in 1932. Current assets at the end of 1933 were $11.9 million.

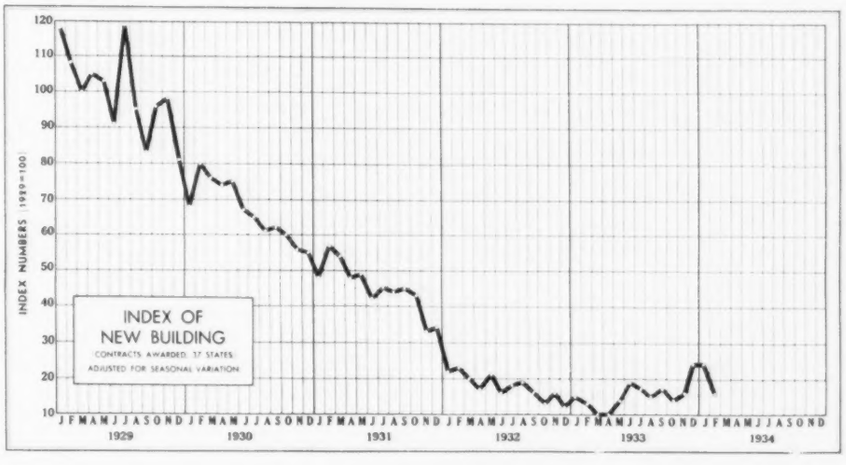
NEW YORK Steam Corporation had net earnings of $3,661,082 in 1933, as compared with $3,650,081 in 1932. Steam billed increased from 11,146 million lb. in 1932 to 11,434 million lb. in 1933. Contents of buildings served aggregated 2,291 million cu. ft. in 1933, 20% over that served in 1932.

RICHMOND RADIATOR COMPANY, INC., lost $330,475 in 1933, against a loss of $354,485 in 1932.

WALWORTH Company reported a net loss in 1933 amounting to $865,879. In 1932 the net loss was $1,306,573.

WESTINGHOUSE ELECTRIC & MFG. COMPANY reports for 1933 a net loss of $8,636,841, compared with a loss of $8,903,540 in 1932.

WORTHINGTON Pump and Machinery Corporation and subsidiaries—For 1933: Net loss after depreciation, taxes and other charges, $1,184,642, against $1,668,287 loss in 1932.



FEBRUARY BUILDING DOWN

New building contracts let in 37 states, as reported by F. W. Dodge Corporation, declined from $72.7 million in January to $43.5 million in February, so that our seasonally adjusted index dropped from 24 to 16. The value of "contemplated work" declined from $202.6 million in January to $161.2 million in February. February, 1933, figures on contemplated work were $55.8 million.

NEWS OF THE MONTH

Construction Code Progress Explained by Voorhees, Code Authority Chairman

NEW YORK — Progress made in getting the Construction Code into working order and details of its operation to date were explained by Stephen F. Voorhees, chairman of the Code Authority for the Construction Industry, at a meeting of the New York Building Congress March 15, held at the Hotel Commodore. According to Mr. Voorhees, Article 3 of the Code (relating to hours, wages, and conditions of employment) "represents a charter of modern advanced industrial relations for the construction industry."

Three hundred and fifty general contractors, sub-contractors, architects, and engineers attended. Mr. Voorhees, who is a member of the firm of Voorhees, Gmelin & Walker, New York architects, stressed the fact that there is no longer a basic or master code, but that Chapter 1 contains general provisions which relate to all members of the construction industry. Chapter 2 relates only to general contractors and approval was expected about March 19. Succeeding chapters relating to various other groups of the industry are in process and will be approved from time to time.

The speaker pointed out that for any group, such as heating contractors, the Code which will govern them will consist of Chapter 1 and the chapter which relates to heating contractors. Thus, Chapter 1 is common to all groups in the industry, but where special provisions are made in the functional chapter, the special provisions will govern over the requirements of Chapter 1.

The Divisional Code Authority for the general contractors will go into effect March 19. Divisional code authorities for other groups have been tentatively set up, but not yet formally organized.

Nominations for the Planning and Adjustment Board, Mr. Voorhees said, were expected to be made on March 23.

It was pointed out that practically all of the features of the original code, formulated by the Construction League of the United States, had been retained in the Code as finally adopted. One new feature of the adopted code is the provision for the Planning and Adjustment Board. It is also to be noted that the Construction Code is not a manufacturing code, except in a few minor cases.

The Planning and Adjustment Board will have two functions. The first is that of planning in its broadest sense, while the second function is to adjust disputes between employes and employers, if they are of importance. In addition, a Construction Appeals Board is being set up with two professional members, two general contractor members, and four special or sub-contractor members.

The speaker stated that the N.R.A. will require the registration of all contractors and that so far as this provision applies, all architects, consulting engineers, general contractors and sub-contractors are considered as contractors.

Humidity Problem Solved in Shoe Factory

ST. LOUIS—A photo-electric relay was used to solve a humidity problem at the plant of the International Shoe Company here. In one room the maximum humidity possible, without condensation of the moisture on the material in process, is desired. When the proper amount of humidity is present, the room appears filled with a thin fog.

This condition could be approximated by manual control and visual inspection at frequent intervals, but since it is beyond the human eye to estimate accurately this high humidity, uniform manual control was found to be practically impossible.

In the installation, a photo-electric relay and light source are mounted outside of the room on opposite walls. A small hole in each wall permits proper focusing of the light beam through the room to the photo-tube. With this arrangement, the electrical equipment requires no special insulation against excessive humidity. The relay operates a solenoid valve that controls the water supply to atomizers which pass the moisture into the air of the room. The equipment controls the humidity so evenly that it is hard to tell whether the atomizers are "on" or "off."

Anthracite Laboratory Issues Reports

PRIMOS, PA.—Seven technical reports were released by the Anthracite Institute Laboratory during the past month, presenting a wide variety of data and descriptions. Subjects included a description and data obtained from tests in 50 cellars in homes burning various types and sizes of fuel; a technical paper presenting a discussion of the various advantages of anthracite as a domestic fuel; approval of a new stoker, described by its manufacturers as the "flivver" stoker, and designed to sell at $195; a description of a new unit developed by the laboratory to burn chestnut anthracite, and a complete description and technical analyses of Virginia anthracite.

Barrett Flays Jobbers

WASHINGTON — The wholesaler group in the plumbing and heating industry was assailed by Robert J. Barrett, president of the National Association of Master Plumbers, in the February issue of the Association's *Bulletin*. According to Mr. Barrett, the Code Committee of the wholesalers apparently wishes to make direct selling the rule rather than the exception in the conduct of their business.

Mr. Barrett urged that the interests of the N.A.M.P. membership can best be served by purchasing from whatever source of supply offers the greatest profit possibilities.

Wrieden, of Warm-Air Furnace Code Authority, Finds NRA Code Assessments Not Collectable

WASHINGTON — Some warm-air furnace manufacturers are not paying their share of the cost of administrating the NRA Code for the furnace industry, and collection of assessments against them is not enforceable, according to A. W. Wrieden, manager of the Code Authority for that industry. Mr. Wrieden made these statements at Group Conference IV of the Conference of Code Authorities and Trade Association Code Committees held under NRA auspices at Washington, March 5.

Mr. Wrieden's full statement follows: "Most codes have a provision that reads something like this: 'Members of the industry shall be entitled to participate in and share the benefits of the activities of the Code Authority and to participate in the selection of the members thereof by assenting to and complying with the requirements of the Code and sustaining their reasonable share of the expenses of its administration.'

"At the time the Code for our industry was written, and after it was approved on November 27, our Code Authority assumed that that meant that anyone who assented to the Code and did not assume his reasonable share of his expenses was in violation of the Code.

"We, therefore, addressed a letter to members of the industry, notifying them of the first assessment. The response, unfortunately, was not what we expected it to be.

"So, at the next meeting of our Code Authority arrangements were made and the Code Authority manager was instructed, and these are the instructions: I will read them from the minutes:

" 'The Code Authority manager is instructed to send another letter to those members who have not paid their first assessment, calling their attention to the fact that non-payment of assessment is in violation of the Code.'

"As you know, minutes of the Code Authorities are sent to the Administration at Washington for their files. It did not take us long to find out that we were making a statement here in our minutes that the Legal Department of the Administration did not approve, and, therefore, a memorandum was sent to the members of the Code Authority by the Code Authority manager, which reads as follows:

" 'The legal department states that the collection of assessments cannot be enforced, and that we shall not notify members that they are in violation of the Code if they fail to pay their assessment.'

"The only thing we can do is to drop them as institute members and prevent them from voting at Code Authority elections.

"It did not take long for some members of the industry to find this out. Thereafter, the result was that collections, instead of becoming better, became worse. Information has reached me from several manufacturers who have contributed toward the expenses of the Code Authority, stating that if all the members of the industry are not compelled to pay their shares, why should a few members of the industry do the part of all of them?

"I therefore ask our Chairman, I ask the Administration to again review that decision. I believe that the only way the Code Authority can successfully operate and can have the finances to successfully operate is that it must be made compulsory that members of the industry who enjoy the activities of the Code Authority be forced to pay the assessments the same as they are forced to comply with all other provisions of the Code."

Willard Heads U. of Illinois

URBANA, ILL.—Prof. Arthur C. Willard, Acting Dean of the University of Illinois College of Engineering, was elected president of the University of Illinois March 13. Professor Willard succeeds Dr. Harry Woodburn Chase, who resigned to become Chancellor of New York University.

A. C. Willard, new president of University of Illinois

President Willard is a graduate of M.I.T., class of 1904. He taught at George Washington University until 1909 and was connected with the Government up to 1913. Since then he has been a member of the faculty of the University of Illinois.

He was a ventilation consultant on the Holland Vehicular Tunnel, the proposed Chicago subway, and other large projects. He was president of the A.S.H.V.E. in 1928 and has served on a number of technical committees of that organization. He is the co-author with L. A. Harding of two books on mechanical equipment of buildings and is the author of numerous bulletins of the Engineering Experiment Station of the University of Illinois. He is particularly well known for his research work on warm-air furnaces, which has been under way at the University since 1915, in cooperation with the National Warm Air Heating and Air Conditioning Association.

NEW YORK—At its meeting here March 19, the New York chapter of the A.S.H.V.E. passed a resolution congratulating Prof. A. C. Willard on his recent election to the presidency of Illinois University.

Motorstokor Holds Sales Convention

NEW YORK—Motorstokor Corporation held its annual sales convention here March 9-10. The welcoming address was made by H. L. Siegmund, sales manager of the company, who introduced G. M. Peltz, chief engineer. Mr. Peltz listed 10 major factors which enter into the design of a stoker.

The next speaker on the program was Walter Barnum, president of the Motorstokor Corporation, who expressed his absolute faith in the future of the stoker industry, following which Charles Redfield, director of sales training of the American Radiator Company, spoke on "The Art of Selling." W. A. Doppler, sales promotion manager, outlined the 1934 sales promotion and advertising program of the company.

At the afternoon session, C. B. Huntress, executive secretary of the National Coal Association, requested the cooperation of the dealers in protesting the code of the gas industry as being unfair to the coal and stoker industries. Mr. Huntress was followed by Edward Cusick, after which R. W. Laurence, president of the Banker's Commercial Security Company, presented a brief talk on time payment sales.

Railroads, Preparing for Next Summer, Build Cooled Cars; Now Have 648 Conditioned

NEW YORK—Fifty new coaches, embodying radical departure from conventional design, including complete air conditioning independent of outside ventilation, streamlining, new seating arrangements, and modern decoration finished in gay colors, are being built by the New Haven Railroad, according to an announcement by John J. Pelley, president of the road. Air conditioning is perhaps the most effective of the measures being taken by the railroads to win back passenger revenue from motorbuses, air lines, and other popular forms of travel.

An order has recently been received by the York Ice Machinery Corporation for air conditioning equipment for 19 cars being built by the Pullman Car & Manufacturing Company.

Pullman itself, according to D. A. Crawford, president of Pullman, Inc., will increase its air conditioned equipment from 276 to 1000 cars by summer. This company has taken $750,000 from surplus as a reserve for experimental cars and installations.

The Burlington Railroad has announced that conditioned cars will be placed in service on their crack trains, including the Aristocrat, North Coast Limited, Empire Builder, Ak-sar-ben, and others.

The Great Northern is having 20 cars equipped with conditioning apparatus for use next summer on the Empire Builder. Twelve of these will be diners, eight observation cars. Ice cooling will be used, each car carrying two tons of ice.

A list compiled by *Railway Age* shows that the Pullman Company now operates 244 improved cars, the largest total under one management.[1] This includes those in regular and exclusive use on lines like the Chesapeake & Ohio, which use the Pullman system of conditioning. The Pennsylvania Railroad leads with 160 cars in respect to the total owned by a railroad, the Baltimore & Ohio following with 62.

The Pennsylvania is the largest user of cars cooled with ice, as contrasted with those equipped with mechanical coolers. The latter are divided into those operated by electric generators actuated by the movement of the train and those connected directly to car axles. In the steam-ejector type, steam is used to evaporate water, thus paradoxically, producing cold.

The following table shows the users of the new cars, together with the type of air conditioning:

Road	No.	Elec.-mech.	Dir. mech.	Ice.	Stm. ejec.
Alton	16	16	..	..	..
A. T. & S. F.	23	1	..	..	22
B. & O.	62	62	..	..	..
B. & M.	1	..	..	1	..
C. & O.	12	..	12	..	..
C. & E. I.	2	..	..	2	..
C. & N. W.	5	1	4	..	..
C. R. I. & P.	4	..	..	4	..
Ill. Central	11	11	..	..	..
M-K-T	8	6	..	..	2
Mo. Pac.	12	8	..	..	4
N. Y. C.	15	..	..	15	..
N.Y.,N.H. & H.	11	..	..	11	..
Penn.	160	9	..	150	1
Pullman	244	89	61	92	2
St. L.-S. F.	17	..	..	17	..
So. Pac.	14	..	14	..	..
T. & P.	7	..	..	..	7
Union Pac.	18	..	15	..	3
Wabash	6	1	..	5	..
Total	648	204	106	297	41

[1]*The 244 does not agree with the 276 cars mentioned above, probably due to the earlier date of the* RAILWAY AGE *survey.*

Galloway

Chicago's $22 million General Post Office

Defends Utility Merchandising

PHILADELPHIA—A strong defense of utility merchandising of domestic appliances was made by Conrad N. Lauer, president of the Philadelphia Gas Works Company, speaking before a session of the Pennsylvania Gas Association's Refrigeration Conference here March 17.

According to Mr. Lauer the aggressive marketing of gas appliances by utilities increases the gas loads and results in a lowering of rates. "The deficits that have been incurred through our merchandising activities amount to but a drop in the bucket compared to the millions of dollars in rate reductions saved to the gas users of Philadelphia," said Mr. Lauer.

Sodemann Talks at St.Louis

ST. LOUIS.—Paul Sodemann, Sodemann Heat & Power Company, spoke on "Engineering of Air Conditioning," at the eighth meeting of the Air Conditioning Forum, March 5.

The regular meeting of the St. Louis Chapter of the A.S.H.V.E. was held before the opening of the Forum.

Newport News is U. S. Climatic Capital

NEW YORK—Newport News is the climatic capital of the United States, according to Dr. Ellsworth Huntington, research associate in geography at Yale, in an address at New York University. He declared that the climate of the Atlantic seaboard from Boston to Atlantic City was more conducive to mental effectiveness than any other region of the United States. California and Florida are still unheard from in rebuttal.

And, added Doctor Huntington, Washington, as the capital of the United States is not fitted, from climatic considerations, for the most effective working conditions. So much unwise legislation has come from Washington during its hot summer months when the legislators are cranky and tired, he indicated, that a summer capitol might better be established at some place like Newport News. The cost of building government buildings there would be repaid within a few years by the saving obtained from better legislation, he said.

For average Americans, the Yale scientist said, the best temperature is one that averages about 64° or 65°, rising to 70° during the day and falling to 60° at night. Under other temperatures, he pointed out, people can and do work hard, "but they pay for it by becoming more tired and cross and in losing their good judgment."

The 65° optimum, Doctor Huntington explained, is for physical well-being. The best temperature for mental activity is not the same, for many tests indicate that for Americans the best mental work is done when the weather averages about 40°. This does not mean that people think best when sitting in a cold room, but rather that the optimum is reached if frost will form outside at night, and the temperature rise to 50° outside during the day. The general conditions of spring and fall fulfill these requirements.

Frost Has Method of Burning Hard Coal Economically

NORRISTOWN, PA.—R. V. Frost, president of The Frost Research Laboratory located here, has described a method of burning certain anthracite forms in heating plants. To show the simplicity and economy of this method, Mr. Frost cites results obtained by him in the past two years in his own home and laboratory.

Screenings composed of two parts rice, two parts barley, one part birdseye, and one part silt are pumped from the bin to the boiler as though the screenings were fluid. Mr. Frost states that the only special equipment used is a motor-driven blower attached to the ash-pit and a few specially constructed firing tools. The essential point about the method is that a fuel bed from 18 to 24 in. deep is maintained. This necessitates the use of a blower operating at a somewhat higher pressure than the usual type of furnace blower.

The intent of the process is that the air shall clinker, thus permitting lifting the clinker off the grates instead of shaking the grates to dislodge the air.

This method of burning fuel is the outgrowth of an attempt to find a means of burning inexpensive yard screenings, and Mr. Frost states that as a general rule it can be applied to a surface-burning boiler, either round or rectangular, that has at least 4 sq. ft. of grate area and which has been installed on a ratio of not more than 1 sq. ft. of grate area to 100 sq. ft. of steam radiation, or 160 sq. ft. of water radiation.

Department Stores to Air Condition

INDIANAPOLIS—The new eight-story structure of the William H. Block Company, large department store here, will be air conditioned on the first floor and downstairs store. A classic modern tearoom, which will be air conditioned, will be located in the rear of the street floor. The architects are Vonnegut, Bohn & Mueller.

NEW YORK—Contracts for a new air conditioning plant are to be let shortly by Bloomingdale's, New York department store located at Lexington Avenue and 59th Street, according to the directors of the store. The modernizing program will include the addition of a restaurant, solarium and sun deck for employes, alterations to the main floor, and additions to the third floor.

Cruikshank Moves

SUNBURY, PA.—The V. M. Cruikshank Utilities, manufacturer of automatic combustion equipment, has moved from Shamokin, Pa., to 18 S. 7th St., Sunbury.

Kohler Elected President of P. & H. I. Bureau

CHICAGO—Reorganization of the Plumbing and Heating Industries Bureau with full responsibility for future policies and financing placed in the hands of the various associations of manufacturers, wholesalers, and contractors was accomplished at a series of three meetings held in the offices of the Bureau here, February 23.

The old corporation, organized in 1919 under the laws of Indiana, was dissolved by vote of the members and its assets transferred to a new corporation with the same name, organized under Illinois laws governing corporations not operated for pecuniary profit. A new board of directors, a new set of officers, and new by-laws distinguish the Illinois corporation from its predecessor.

The purposes of the new corporation are:

"To maintain a publicity and information bureau for gathering, classifying, and disseminating useful knowledge relative to plumbing, heating, ventilating, air conditioning, water supplies, sewerage, drainage, sanitation, and kindred subjects;

"To develop a wider knowledge and a better understanding and appreciation of the products of the plumbing, heating, air conditioning, and similar industries;

"To promote and encourage harmonious relations between members of the association and the general public;

"To do and perform all other acts incidental to the purposes aforesaid and authorized by the statutes under which this association is incorporated."

Ton of Refrigeration Defined

NEW YORK—The discussion regarding the definition of a ton of refrigeration has been settled by the American Society of Refrigerating Engineers, according to an announcement by David L. Fiske, secretary of the Society. A ton of refrigeration is now formally defined as heat removal at the rate of 12,000 B.t.u. per hr.

A ton-day of refrigeration is defined as the quantity of heat removed when the rate of 1 ton is operative for one day, or —288,000 B.t.u.

An alternate method of expressing the rate of removal of heat is in (—) B.t.u. per hr.

The definition was made by the Committee on Standards of Measurement of the Society, followed by a letter ballot of members of the Society, and formally adopted by the Society's Council, February 27.

Conditioning Dealers Lay Sales Plans

PITTSBURGH — Westinghouse air conditioning dealers from the eastern part of the country convened at the company's headquarters in East Pittsburgh early in March for a two-day meeting at which engineering, sales, installation, and associated air conditioning problems were discussed.

A feature of the meeting was an inspection of the Westinghouse company's new manufacturing aisle completed at a cost of $125,000 and devoted exclusively to the production of air conditioning units.

COMING EVENTS

MAY 22-25, 1934. Heating, Piping and Air Conditioning Contractors Convention at Atlantic City, N. J. Headquarters at the Ambassador Hotel.

MAY 28-31, 1934. Fifty-Second Annual Convention and Exposition of the National Association of Master Plumbers, to be held in Washington, D. C., at the Washington Auditorium.

JUNE 12-14, 1934. Mid-Year Meeting of the National Warm Air Heating and Air Conditioning Association, to be held in Chicago, Ill. Headquarters at the Morrison Hotel.

JUNE 12-15, 1934. Twenty-Fifth Annual Convention of the National District Heating Association, to be held in Rochester, N. Y.

JUNE 20-22, 1934. Spring Meeting of the American Society of Heating and Ventilating Engineers, Buck Hill Falls, Pa. Headquarters at The Inn.

JUNE 20-22, 1934. Spring Meeting of the American Society of Refrigerating Engineers, to be held in Skytop, Pa. Headquarters at the Skytop Club.

SEPTEMBER 19-29, 1934. Second Annual National Electrical and Radio Exposition to be held at Madison Square Garden, New York.

OCTOBER 29-NOVEMBER 2, 1934. Sixteenth Annual Convention and Exposition of the American Gas Association, to be held in Atlantic City Auditorium, Atlantic City, N. J.

New Company Formed

WASHINGTON—Permission for selling securities under the securities act has been asked by the Gas Generator Corp., New York, a Delaware Corporation, which proposes to manufacture and deal in machines and inventions for making gas and vapor to furnish light, heat and power, as well as refrigeration. The company expects to issue $500,000 capital stock.

The underwriter, Harvey W. Sieg, Inc., 32 Broadway, New York, is to receive 25% commission. Officers are Lewis A. Ellis, East Orange, N. J., president; K. D. Ellis, East Orange, N. J., vice-president, and H. C. Heard, New York, secretary-treasurer.

Corbett Predicts Building Boom

WASHINGTON—A building boom greater than that which followed the World War is predicted by Dr. Harvey Wiley Corbett in a forecast issued by the American Institute of Architects.

Sarco Appoints MacKinney

NEW YORK—Emilio N. MacKinney has been appointed sales representative of Sarco Company, Inc., to cover Mexico City. Mr. MacKinney is a Mexican and a graduate of M.I.T.

Thrush Opens N. Y. Office

PERU, IND.—H. A. Thrush & Company announces the establishment of a New York Metropolitan office at 272 East Third St., Mount Vernon, N. Y., with Thomas O. Lanphier in charge.

Standards Proposed for Anthracite Coal Burners

NEW YORK—A meeting for the purpose of adopting commercial standards for domestic underfeed burners which use Pennsylvania anthracite was held at the Hotel McAlpin March 14. Producers, distributors, and users of these burners attended the meeting, which was the final one and which approved commercial standards which will go into effect August 1, provided the changes made in the tentative code are acceptable to the Bureau of Standards.

Previous meetings have been held September 29 and December 13, 1933, at which time proposed commercial standards were set up. The standards cover only those burners burning Pennsylvania anthracite, of the underfeed type, and those with a normal capacity which does not exceed 50 lb. of fuel per hour.

The meeting was in charge of I. J. Fairchild, chief of the Division of Trade Standards, Bureau of Standards. The code was presented by Allen Johnson, of the Anthracite Institute Laboratory, and by W. B. Hughes, assistant sales manager of the Iron Fireman Manufacturing Company.

The purpose of this standard is that it shall serve as a basis for certification of quality and performance by the manufacturer and installing contractor, and as a basis for performance criteria on the part of the buyer.

Principal among the provisions of the code are: The hopper shall have a capacity of 15 times the maximum hourly rate of coal feed; the lower charging edge of the regular coal hopper shall not be higher than 4 ft. above the floor level; overload protective devices shall be so arranged that the user may reset the mechanism.

Ash receptacles, whether cans or space beneath the furnace, shall have sufficient capacity to receive ashes from 15 hr. of operation at the maximum rated capacity. The motor shall be free from interference to radio reception.

In connection with the fan, the entire feed draft system shall be so designed as to maintain as nearly as practical a constant volume flow of air at a fixed setting of air.

Under operating requirements, the code provides that the overall efficiency of the unit (burner and boiler) at all points above 50% of maximum coal feed shall be above 50% when installed in a round sectional iron boiler having three intermediate sections and 1½ in. of asbestos insulation or equivalent. Ash loss shall not exceed 7½% of the B.t.u. content of the coal as fired.

Flue gas shall not be below 6% in carbon dioxide content at any rate of operation above 50% of maximum coal feed.

The burner shall either be so constructed or so controlled as to bank for an indefinite period.

So far as capacity is concerned, in connection with installation, a measurement of the radiation in the building will be required to which an allowance of 20% shall be added for mains and risers. The output rating of the boiler shall conform with Boiler Rating Code No. 3 of the A.S.H.V.E.

The installing contractor will be required to examine the breeching and smokepipe connections to the stack to insure their being in safe operating condition. The contractor must also investigate to see that flues are of sufficient cross-sectional area, height, and location at the time of installation to insure a negative pressure in the boiler or furnace.

The code recommends that manufacturers of burners conform to the standards and attach a printed label to the equipment worded as follows:

"This burner is certified jointly by the manufacturer and installing contractor to conform to all requirements of Commercial Standard CS for Domestic Burners for Pennsylvania Anthracite (underfeed type) issued by the U. S. Department of Commerce."

Manufactured by _____
Manufacturer

Installed by _____
Contractor

At the meeting, a committee of 15 was appointed which will decide certain questions of administration and so forth. Members of this committee include W. B. Hughes, Iron Fireman Manufacturing Company; G. M. Peltz, Motorstokor Corporation, and Oscar Ostby, Electric Furnace-Man, Inc., representing the manufacturers of stokers; Allen Johnson, representing the Anthracite Institute; H. F. Cox, a Paterson, N. J., heating contractor, and others, representing burner distributors; C. Millard Dodson, of Weston Dodson & Co., Inc., and E. L. Buller, of the Hudson Coal Company, representing the coal operators, and others.

25 YEARS AGO IN

The Heating Ventilating Magazine

APRIL, 1909

FRENCH HEATING AND VENTILATING ENGINEERS were organized under the name "Association Amicale des Ingenieurs de Chauffage et Ventilation de France."

WILLIAM H. McKIEVER, New York, announces that he has opened an office in Union Square to conduct a general engineering and contracting business for the installation of heating and ventilating apparatus, power plants and other piping work.

AMERICAN RADIATOR COMPANY'S annual report showed net profits of $901,254 for the year 1909.

L. J. WING MFG. CO., New York, increases its capital stock from $25,000 to $100,000.

FREED HEATER CO., Collegeville, Pa., has been organized with a capital of $50,000 to succeed the Steam Fitters' Heater Company.

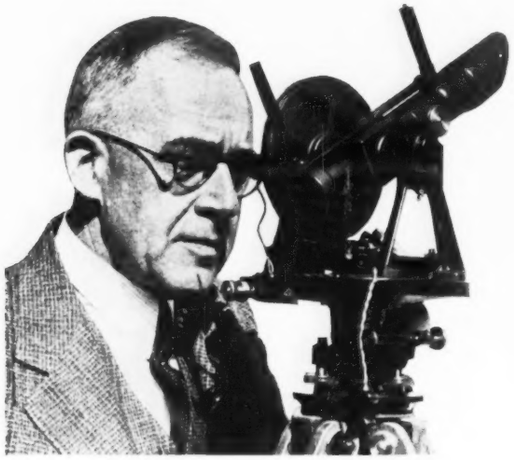
A NATURAL GAS PIPE LINE from West Virginia to Covington, Ky., and Cincinnati is nearing completion.

Caulley Joins Republic

YOUNGSTOWN, OHIO — Ralph G. Caulley has joined the Detroit district sales office of Republic Steel Corporation, according to announcement made by N. J. Clarke, vice-president.

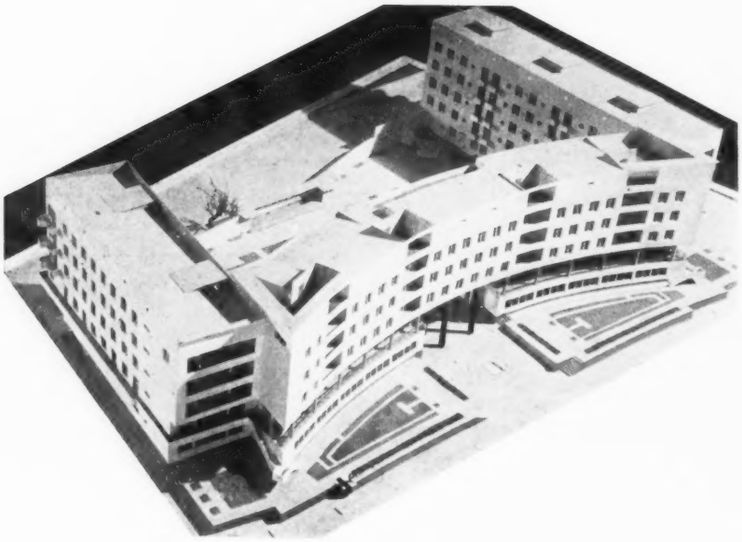
Mr. Caulley has been connected with Wheeling Steel Corporation for 14 years.

Picture Paragraphs

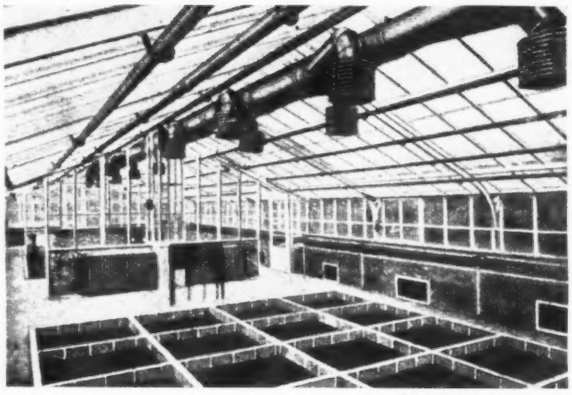


The Washington Post

THE WEATHER MAN. Willis R. Gregg, who has completed two months as chief of the U. S. Weather Bureau, shown here peeping through a theodolite, equipped with a stroboscope, an instrument for measuring wind velocity. Mr. Gregg, a native of Phoenix, N. Y., disclaims credit for the recent record-breaking weather.

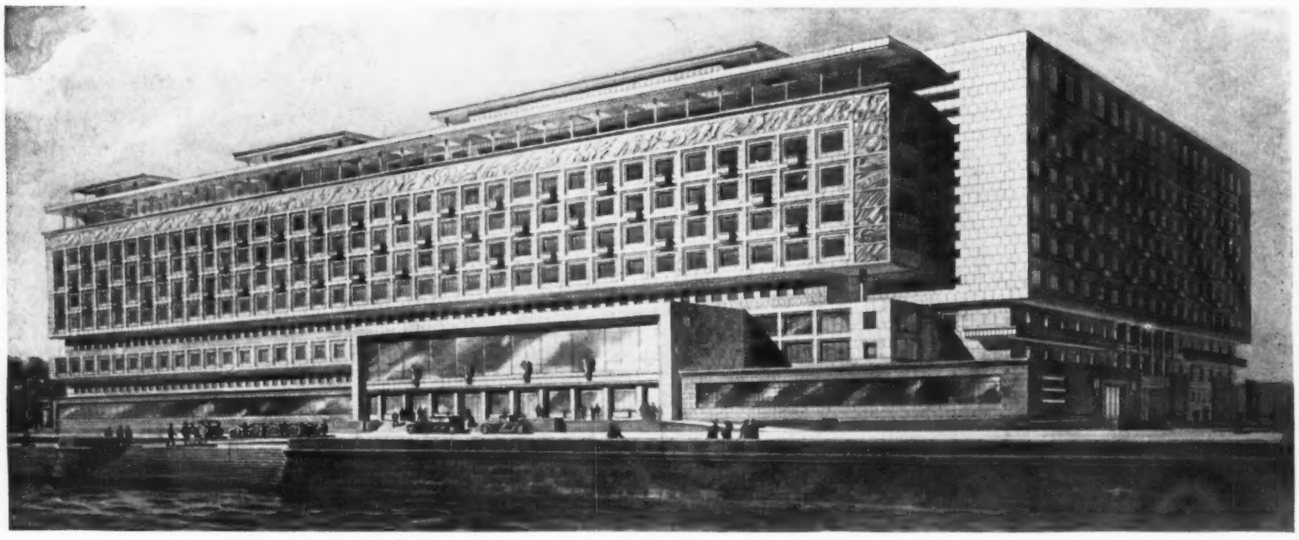


↑ THE HOUSE OF LENINGRAD SOVIET—A modern apartment for Russian officials with latest type heating system, automatic refuse conveyors, communal mechanized laundry, etc. It was designed by Prof. Eugene Loewinsohn of the faculty of the Leningrad Institute of Civil Engineering who won first prize for a gigantic project creating a new city, "Novo-Mourmansk," on the White Sea.



Engineering Progress

← UNUSUAL OUTLETS are a feature of this German air conditioning system in a hot-house.

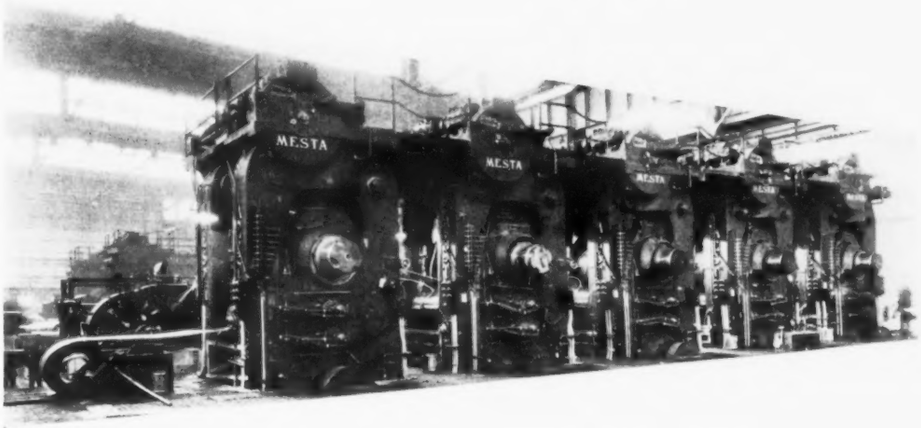


↑ A $15 MILLION HOTEL. The Intourist Hotel in Leningrad, Russia, a highly mechanized building with an operating personnel of 1000 people, and a restaurant seating 2000. Eugene Loewinsohn and I. I. Fomine were the designers.

↑ FORMER FOOTBALL STAR. Col. Horatio B. Hackett, appointed general manager of the Public Works Emergency Housing Corporation last month, is a nationally recognized architect and engineer. He is a graduate of West Point, class of 1904.

↑ ORANGE GROVE HEATERS are illustrated in this diorama being completed by the artist, Miss Elizabeth Keller. The U. S. Weather Bureau, through its Fruit Frost Service, issues frost warnings in time for growers to light the heaters.

10,000 TONS OF TIN → PLATE per month is the capacity of this new five-stand tandem mill recently completed in the plant of the Inland Steel Company.



HEAT LOSS COEFFICIENTS UNKNOWN. It would be a tough job to figure the radiators needed in these buildings, for the one to the left is built of 65 tons of 12-in. thick blocks of coal, the one to the right of 65 tons of ice. The coal structure is the headquarters of the Williamson, W. Va., Chamber of Commerce, while the ice building was built by students on the campus of Lawrence College, Appleton, Wis.

Modern Design Feature of 1934 Oil Burners Displayed at Show; Standard Cost System Approved

PHILADELPHIA — Optimism and business activity marked the 11th national Oil Burner Show and Convention of the American Oil Burner Association here March 5-9, which drew an attendance to the large Commercial Museum of approximately 25,000.

Featured by special sections in all three Philadelphia morning papers on Sunday, March 4, the oil burner show opened on the evening of March 5 to large first-night crowds representing all branches of the industry and the public. Because of the advance advertising and the issuing of some 70,000 invitations the attendance mounted with each succeeding day, with the last day showing the largest attendance of the week

The exhibits, spread out through 126 booths, revealed that where formerly the industry gave its chief attention to engineering problems it has now turned its attention to design and merchandising.

The convention program was featured by a Code Merchandising Session and an Engineering Sales Session. Featuring the Code session was a review of the Code Authority activity by Morgan L. Hammers, chairman of the Oil Burner Code Authority, and an official administration announcement from the platform by W. Schwan, assistant deputy administrator of NRA, who reported that the standard cost accounting system for the oil burner industry had been approved by the administration.

Pointing out that this announcement had long been awaited by the industry, Mr. Hammers said that government approval of this uniform cost accounting plan promised a remedy for "persistent chiselling and severe price cutting on the part of the recalcitrant minority." While the industry's code stipulates that it is unlawful to sell below cost, there has been no uniform or effective method of cost determination up until the present moment, Mr. Hammers explained, adding that the whole job of code compliance "has been tremendously simplified and made doubly effective by this favorable decision on the part of the government, because price regulation is the heart of all other fair trade practice regulations as contained in this and other codes." "If there is developed a hard-hitting enforcement program in Washington," Mr. Hammers said, "the industry's new cost accounting plan will prove to be a most effective instrument for curtailing destructive price competition, and, through stabilization of the price structure, for placing all units of the industry on an economic basis. But whatever instruments are placed in the hands of the Code Authority, they must, to be effective, be fully supported by the enforcement machinery of the government itself."

In commenting on NRA codes, in general, and the oil burner code, in particular, Mr. Schwan pointed out that the oil burner code was among the first 25 codes to have been approved by President Roosevelt. "We are now entering on the second phase of industry codes," Mr. Schwan said. "The immediate past has been concerned with writing codes and getting code authorities into active administration,

R. M. Sherman, 1934 president of the American Oil Burner Association

whereas the time is now here when the fullest enforcement will be scheduled. In answer to the question as to whether the government and the NRA mean to see individual code regulations fully enforced, the answer is, 'Yes'."

Approval of a standard cost accounting system for the oil burner industry marks a final link in the development of the Code by the Code Authority, for under the code, as approved September 18, it was mandatory upon all members of the industry to file their prices 10 days in advance of their effective date and that "no member of the oil burner industry shall sell or exchange any product of the industry at a price below his own individual cost as determined by a standard cost accounting system to be set up by the Code Authority for the oil burner industry, subject to the approval and supervision of the administration."

T. K. Quinn, vice-president of General Electric Company, who was also a speaker before the convention, discussed the function of the large corporation in the oil burner industry, and pledged the company which he represents, to fair and constructive competition. He condemned the policy whereby a large manufacturer operates in a particular field on a "lowest price" basis at a loss to himself and to the demoralization of his competitor, expecting to make the deficit up in other lines.

Other speakers were J. W. McEachren, of Ernst and Ernst, who with members of the code authority developed the industry's newly approved regulation, and R. S. Bohn, Chairman of the Dealer Division of the A.O.B.A.

Seeing "definite possibilities of very rapid expansion of the fuel oil market," W. H. Butler, of Standard Oil Company of New Jersey, stated that already "the demand for the oil burner is more a necessity than a luxury," and predicted "a banner year for 1934."

"Refineries have come to realize the importance of this business and have been conducting considerable research on domestic fuels to the

point where they have so improved their methods of production and manufacture that the oil burner salesman can now assure his prospect of satisfactory oils from any number of sources of supply," Mr. Butler asserted.

Speakers at the engineeering sales session presented viewpoints on economies in oil burner operation and fuel consumption, a better trained and engineer-minded salesman, the essential place of the oil burner in the air conditioning industry, and the importance of the range burner in the oil heating industry.

Talks on these varied subjects were delivered by Nelson B. Delavan and L. M. Persons, Penn Electric Switch Company, who gave a joint presentation on a study of home temperature control problems; Dayle G. Malone, Petro-Nokol Company, Chicago, delivered a paper on engineer training for the salesman; Andre Merle, of the staff of Clyde R. Place, New York, gave a paper on air conditioning, and F. W. Steirhoff, sales promotion manager of the Silent Glow Oil Burner Corporation, presented a paper on range burners. Messrs. Delavan and Persons disscussed in detail the problem of controlling house temperatures so that there would be greater uniformity with a minimum consumption of oil and the possibility of developing control equipment so that there would be close control of the comfort level in the rather poorly-constructed home as well as in the well-insulated and well-built home.

Mr. Merle told his audience of the types of air conditioning processes and equipment available and pointed out that the oil burner and oil heating systems provided the essential temperature control for year-around conditioning as well as offering the medium for summer cooling and air conditioning. Mr. Malone strongly advocated more engineering study for the salesman, warning against the high pressure, quick sale without fully acquainting the homeowner as to his needs in the light of conditions in his own particular house.

Mr. Steirhoff urged the power oil burner dealer to supplement his regular inventory with range burners since these present a definitely profitable line and should be considered just as much a part of the oil heating business as the fully automatic power burner designed for central heating plants.

R. M. Sherman was elected president of the Association, and C. J. Bassler was elected chairman of the dealer division. Mr. Sherman is president of the Silent Glow Oil Burner Corp., Hartford, Conn., and Mr. Bassler is president of the Air Conditioning Corporation, Chicago. New vice-presidents are: W. J. Smith, Cleveland Steel Products Corporation; J. A. Lattner, Century Engineering Corporation; S. C. Hope, Gilbert and Barker Mfg. Company, and W. F. Brannan, Anchor Post Fence Company, and Mr. Bassler, representing the dealer division.

Directors elected to the manufacturer division for a three-year term are: M. J. Hammers, Petroleum Heat and Power Company; R. C. Hoffman, York Oil Burner Company, Inc.; J. H. Hirsch, Automatic Burner Corporation; M. F. Cotes, Motor Wheel Corporation; Eugene C. Clark, Bethlehem Foundry and Machine Company, and Messrs. Lattner and Hope. Those named to the executive committee are the following: W. S. Salway, president, Electrol Incorporated, and Messrs. Sherman, Hammers, Smith, and Hope.

New Air Conditioning Bibliography

WASHINGTON—A third edition of the air conditioning bibliography published by the Department of Commerce is contemplated, according to G. Reed Salisbury, Chief of the Industrial Marketing Section, Domestic Commerce Division of the Department.

The first edition was a 29-page mimeographed bulletin.

L. R. Snelling, manager of planning and distribution, National Radiator Corporation

National Radiator Shifts Personnel

JOHNSTOWN, PA.—National Radiator Corporation has announced a number of personnel changes. These include the appointment of L. R. Snelling as manager of planning and distribution. C. L. Krause, vice-president, will in the future direct all branch and divisional sales activities.

The company has also made two district appointments, Paul J. Bracken having been made manager of the company's Boston sales office, and Fred R. Dannies, manager of the New York office. Rudolph A. Schmicker has been made assistant manager of the New York office.

Mr. Snelling has been in the heating industry for 21 years, having started with the American Radiator Company. In 1929, he became associated with the National Radiator Corporation as manager of its Buffalo branch; in 1932, he was transferred to Philadelphia as manager of the company's branch in that city, and in 1933, was called to Johnstown to direct all branch and divisional sales activities.

In his new capacity, Mr. Snelling will supervise the development of sales plans and other policies of the corporation.

Mr. Bracken was formerly manager of the company's Cincinnati office and Mr. Dannies has been sales promotion manager of the company, prior to which he was manager of the Buffalo office.

A. G. A. Will Hold Exposition

NEW YORK—The American Gas Association has announced that it will hold its 16th annual convention in Atlantic City, N. J., October 29-November 2, 1934. At the same time announcement was made that the exposition formerly held in connection with the convention will again be held this year in the Atlantic City Auditorium.

New Plant for Monarch

ST. LOUIS—Monarch Metal Weatherstrip Company has purchased an acre of ground here for a new plant, for which excavation has already begun.

Timmis Heads Copper Pipe Sales

NEW YORK—W. W. Timmis has been appointed manager in charge of sales of the Copper Pipe and Fittings Division of American Radiator Company, according to an announcement by Arthus R. Herske, vice-president and general manager of sales. Mr. Timmis has been connected with the heating industry since 1920, having first worked as sales engineer for the Kewanee Boiler Corporation. He is a licensed professional engineer and a graduate of Swarthmore College.

Gets Ray Chicago Franchise

CHICAGO—Ray Heat & Power Co., 600 W. Van Buren St., Chicago, has been granted the Ray Oil Burner Company franchise here.

E. P. Fahey is president, M. J. Boyce is secretary, and James T. Igoe is treasurer of the new company.

Beeler in Charge at Wurlitzer

NORTH TONAWANDA, N. Y.—A new department for manufacturing air conditioning equipment has been organized by the Rudolph Wurlitzer Manufacturing Company here. Charles F. Beeler will be in charge of design and installation of this equipment.

Engineer Licensing Discussed by A. S. H. V. E.

NEW YORK—A paper on school ventilation, a talk on licensing professional engineers, and nominations of officers for the coming year were features of the March 19 meeting of the New York chapter, A.S.H.V.E. A. G. Corbin, Deputy Superintendent of Schools at Yonkers, had the principal paper of the evening, which was presented by T. W. Reynolds. Mr. Corbin, who is in charge of 37 schools and is a member of the National Council of School Board Construction, made a strong plea for more simple and more standardized school buildings and equipment and urged the necessity of reducing operating costs.

D. B. Steinman, consulting engineer and past president of the New York State Society of Professional Engineers, outlined the history of the licensing law for engineers in New York, described requirements, and warned the audience that a 30-day sentence could be imposed upon engineers in New York who use the word "Mechanical Engineer" on their letterheads unless they are licensed professional engineers.

Arthur Ritter, chairman of the Convention Committee, made his final report in which he said that all of the money advanced his committee by the national society for the recent convention had been returned unused with the exception of $38.61.

H. W. Fiedler was nominated for president of the chapter for the coming year. Other nominations include W. M. Heebner for treasurer, and T. W. Reynolds for secretary.

Carrier Appoints Grandstaff

CHICAGO—C. H. Grandstaff has been appointed district supervisor in the merchandising department of the Chicago office of Carrier Engineering Corporation. He will assist Carrier dealers in promoting air conditioning and commercial refrigeration business.

Mr. Grandstaff was formerly regional sales manager for the Trupar Mfg. Company.

Ventilation Bill Still in Committee

ALBANY, N. Y.—The proposed amendment to Section 451 of the Education Law of New York, which would do away with the provision for 30 c.f.m. of fresh air per pupil in school buildings, is still in committee, and may not come up before either the Assembly or the Senate this term.

Willis Carrier Talks in Detroit; Cleveland

DETROIT—Over 300 heating and ventilating engineers, contractors, and others heard Willis H. Carrier and R. J. Thompson speak here March 5 at the monthly meeting of the local A.S.R.E. group.

Mr. Thompson, who is associated with Kinetic Chemicals, Inc., talked on "Facts about Freon." He explained that this refrigerant is non-inflammable and non-combustible, and is non-corrosive to most metals used in refrigerating equipment.

Mr. Carrier spoke particularly of climate and its effect on the development of air conditioning. He stressed the work done by Professor Huntington of Yale and the work of the A.S.H.V.E. Laboratory.

CLEVELAND—Thirteen groups, most of which are identified with building construction, management, and maintenance, joined with the Electrical League in a meeting at the Hotel Statler Ball Room, March 6, at which Willis H. Carrier spoke on air conditioning.

The groups attending included the American Institute of Electrical Engineers, American Society of Heating and Ventilating Engineers, American Institute of Architects, Building Owners and Managers, Engineering Society, commercial buildings section of the Electrical Maintenance Engineers' Association, consulting engineers, department store executives, heating and ventilating contractors, Hotel Men's Association, industrial engineers, restaurant owners and managers, and theater owners.

Stevenson Addresses N.Y. Group

NEW YORK—At the regular meeting of the New York section of the A.S.R.E., March 22, members were dinner guests at the plant of the Electrical Testing Laboratories. Those who attended had an added pleasure in the presence of A. R. Stevenson, Jr., General Electric Company, president of the National Society.

In a brief address Mr. Stevenson outlined the scope of engineering interests covered by what is generally known as the field of refrigeration engineering. Gordon Thompson, assistant chief engineer of the Laboratories, outlined methods of measuring temperatures in use at the Laboratories, describing briefly recent developments in electrical means of measurement. Following Mr. Thompson's address a conducted tour of the Laboratory buildings gave those present an opportunity to see the facilities which the Laboratories has installed for testing refrigerating and air conditioning apparatus.

About 50 members attended the meeting.

Murray Heads O. B. Code

WASHINGTON—Administration of the Oil Burner Code has been placed in the hands of Deputy Administrator B. W. Murray, following the resignation of Major R. B. Paddock. Beverly S. King, Assistant Deputy Administrator, who proposed the basic code for the heating industry, has also been detailed to the Oil Burner Code.

Penn Switch Announcements

DES MOINES, IA.—Penn Electric Switch Company has opened a new field office at 839 Beacon St., Boston. A. L. Rubel has been appointed to work out of this branch.

Robert H. Luscombe recently joined the company and is in charge of sales of controls to the gas industry. He was formerly associated with the Des Moines Gas Company.

Frank H. Dewey

Dewey Heads Air Conditioning Division

DETROIT—Greatly increased activity in the heating appliance division of Gar Wood Industries, Inc., are contemplated, according to Logan T. Wood, vice-president and general manager in charge of operations. Mr. Wood announced the appointment of Frank H. Dewey as manager of the Air Conditioning Division. For many years Mr. Dewey was sales manager of the Wood Hydraulic Hoist & Body Company, of which Gar Wood Industries, Inc. is the successor.

Plans for broadening this division of the company include extensive additions to the distributor and dealer organization, under the direction of C. J. McCaffrey, sales manager.

Other activities of the company are handled by the Hoist and Body division and the Automotive division. Gar Wood speed boats are built by a separate corporation.

Boiler Inspection Put on Fee Basis

WASHINGTON—A new boiler inspection law proposed by Commissioners of the District of Columbia provides for an annual inspection of all steam boilers, except certain gravity return systems not exceeding 15 lb. pressure.

The fees proposed are: miniature boilers, $3; vertical fire tube boilers, cast-iron boilers, and air tanks, $5; horizontal fire tube and water tube boilers, $10. When inspections are made on Sunday, 50% is to be added to these fees. Where boilers are insured and inspected by an insurance company licensed to do business in the District, the above fees are to be cut in half. Penalty for violation of the act is $40 for each day.

The present boiler inspection law provides for the appointment of an inspector, who retains all fees which he receives. The cost of inspection is $5.

Smith Heads Richmond Sales

NEW YORK—Don D. Smith, formerly manager of branch offices, has been made general sales manager of Richmond Radiator Company, Inc.

Cal Grover, formerly with National Radiator Corporation, has been appointed to represent Richmond in New England.

City-Owned Street Steam Plant Proposed

ST. LOUIS—A survey to determine the practicability of establishing a municipally-owned district heating plant for the two-fold purpose of eliminating smoke and furnishing low-priced heat, has been recommended by Director of Streets and Sewers F. J. McDevitt.

"The majority of residence boilers operate at a low degree of efficiency," said Mr. McDevitt. "A central plant operating at high efficiency probably could furnish heat at a price below that which householders now pay for fuel."

The Union Electric Light & Power Company is at present operating two central heating plants in St. Louis. The utility's system, however, serves the business districts primarily. The utility operates under a permit, but is reported to have no franchise.

A committee to undertake the survey has been appointed with Raymond Tucker, of the Engineering Department, Washington University, as chairman.

Michigan Engineers Cut Operating Costs

EAST LANSING, MICH.—Engineers of Michigan state institutions who were responsible for setting new records in heating operating costs met here recently to discuss possibilities of bettering the 1933 record.

According to B. J. Abbott, secretary of the State Administrative Board, a saving of $60,500 in fuel and power costs for 22 institutions was made in 1933 as compared with 1932.

Savings in the use of coal accounted for $36,000 and savings in power costs and fuel oil accounted for the balance of $24,500.

These direct savings were made despite a 45% increase in patients at the Ypsilanti State Hospital since July 1, 1932, the opening of a new receiving hospital at Newberry in October, 1933, with the incident increase of 25% in the space to be heated, the opening of a new receiving hospital at Ionia in November, 1932, with an increase of 37% in the space to be heated, and despite also the colder weather that has prevailed throughout this winter.

The results were attained largely by stopping steam and hot water leaks, by maintaining even temperatures, by keeping boilers meticulously clean, and by competition between the various engineers for enviable records of efficient operation of power plants.

Supervising Architect Moves

WASHINGTON—Offices of the Supervising Architect of the Treasury Department have been moved to the government warehouse building at Ninth and D Streets Northwest.

Census of Buildings Nears Completion

WASHINGTON—Field work on the Real Property Inventory is nearing completion, according to Willard L. Thorp, director, Bureau of Foreign and Domestic Commerce. The enumerators are sending their schedules to Washington, where they are being prepared for tabulation by a special unit set up under the direction of D. E. Casey, who is the project chief, working under Mr. Thorp.

Every phase of the building materials industry of the United States should obtain useful information from this inventory, which is a house-to-house canvass of residential structures in 63 cities conducted by over 5,000 workers taken from the ranks of the white collar unemployed. The project was financed by funds granted from the CWA.

The Census Bureau's facilities are being utilized both in the field and in tabulating and recapitulating the data of the inventory assembled in Washington. The enumerators have gathered data on the physical condition of every residential structure visited in the 63 cities and their records will show the type of buildings and the materials of construction, type of heating, sanitary facilities, and other major details of its construction.

Electric Thawing Common in Cold Spell

SCHENECTADY, N. Y.—The unusual severity of the past winter has placed electrical thawing of frozen pipes in the limelight, according to General Electric engineers. Arc-welding generators have been particularly useful for this service.

Although the practice of heating frozen pipes by passing an electric current through them is not new, it has taken a season when frozen water lines were numerous to bring this thawing method into prominence. Arc-welding generators, because of their special electrical characteristics, are extremely well suited to the work.

The process itself is simple: The leads from the generator are connected to the pipe or piping system so as to include the frozen section in the electric circuit. The heavy current warms the pipe and shortly melts the ice. The current required and the time necessary to effect thawing depend on the size and length of the pipe. For instance, it has been the experience of some users that 250 amperes will thaw a ¾-in. pipe 300 feet long in from 3 to 10 min.—and again that a 3-in. pipe 100 ft. long will take nearly 1 hr. with the current in the neighborhood of 500 amperes. Voltages involved vary widely, usually between 10 and 50 volts being required. It is therefore readily understood why a welding generator, whose output voltage can be varied over a considerable range for several different current values, is so well adapted to thawing.

PITTSBURGH—Used in a location where a blow-torch could not be applied because it probably would have caused fire, or at least scorched woodwork, an electric heating pad and fan heater were used quite successfully in thawing frozen water pipes during the recent zero days here. Developed as comfort devices, these units seem to perform as many different services as their owner's ingenuity can provide for them.

Harris Distributes Toridheet

CLEVELAND—Cleveland Steel Products Corporation announces the appointment of Jay Harris, formerly director of the installation and service school of the Silent Automatic Corporation, as distributor for Toridheet oil burners in Queens County, N. Y. Mr. Harris is president of the Toridheet Engineering Corp., 117 Queens Blvd., Forest Hills, N. Y.

Smith Heads G. E. Gas Sales

SCHENECTADY, N. Y.—H. B. Smith has been placed in charge of gas furnace sales activities of the merchandising division of the Air Conditioning Department, General Electric Company, with offices in New York.

Mr. Smith has had several years experience with gas heating promotion work with the Consolidated Gas Company of New York and with the Central Hudson Gas and Electric Co., Poughkeepsie, N. Y.

Building Conference Held at Illinois

URBANA, ILL.—A conference on Home Building was held at the University of Illinois here March 15-17, in the Electrical Engineering building. The meetings were sponsored by the Second Annual Mineral Industries Conference of Illinois. About 20 societies and other organizations cooperated, including the American Institute of Architects, A.S.H.V.E., Committee of Ten, Illinois Society of Engineers, National Warm Air Heating and Air Conditioning Association, and Western Society of Engineers.

Purposes of the conference were to acquaint manufacturers of building materials with the homeowners' viewpoint, to bring to the attention of home builders the mineral resources of Illinois available for home building, and to investigate the possibilities of better and lower-priced homes.

A. P. Kratz, research professor of mechanical engineering at the University, presented a paper on "The Importance of Better House Construction in Improving the Comfort and Effectiveness of Heating and Cooling"; S. R. Lewis, consulting engineer of Chicago, addressed the conference on "Heating Installation with Relation to Available Fuels." F. H. Reed, chief chemist of the Illinois State Geological Survey, talked on "Insulating Materials."

Professors A. C. Willard and A. P. Kratz reviewed the subject of "Research in Heating, Ventilating and Air Conditioning," which was followed by a discussion by S. R. Lewis.

The final session was presided over by Professor Willard.

Haynes Visits Chicago

CHICAGO—The feature of the regular monthly meeting of the Illinois Chapter of the A.S.H.V.E., March 12, was the observance of Presidents' Night. C. V. Haynes, national president of the Society, was the guest of honor. Mr. Haynes was accompanied by the national secretary, A. V. Hutchinson.

President Haynes chose for the subject of his message to the chapter, "Your Society—What Does it Mean to You?" He outlined plans and prospects for 1934.

S. I. Rottmayer announced that he intends to build a $15,000 home and asked the advice of four of the past presidents of the chapter as to the best method of heating the new home. J. H. Hale urged the use of a vapor system, while Harry M. Hart advocated the use of a gravity hot water system. Dr. E. V. Hill favored a fan furnace unit, and S. R. Lewis suggested an oil-burning hot water boiler with a circulating pump. A lively discussion on these four proposals continued until the close of the meeting.

John Howatt was elected president of the chapter for the coming year.

Titusville Appoints Fenhagen

TITUSVILLE, PA.—The Titusville Iron Works Company announces the appointment of F. Donald Fenhagen as Maryland representative of its company, with offices in the Calvert Building, Baltimore, Md.

Chart for Figuring Fuel Consumption

WILLIAMSPORT, PA.—A chart which enables a residence or apartment owner to determine in advance the annual cost for fuel in the operation of magazine feed boilers has been designed by J. A. Waddell, Chicago representative of the Spencer Heater Company located here.

A simple computation takes into consideration degree-days which for most of the principal cities in the United States are listed alphabetically on the chart folder. The chart consists of five printed scales showing the number of square feet of installed radiation, both for steam and water, degree-days, tons of fuel used per season, cost per ton of fuel, and the costs of fuel for the season. The heating cost of each individual case for the season is obtained by drawing straight lines across the five scales from one number to the other, as applicable. In order to estimate the cost of heating schools or churches where fire is not maintained constantly, use is made of an auxiliary table on the same chart. The charts can be obtained without charge from Spencer Heater Company.

Correspondence Course in Conditioning

BOSTON—A practical home study course in air conditioning is offered by the Division of University Extension, Massachusetts Department of Education, and is available to all residents of the United States, according to James A. Moyer, director. The course combines instruction in the necessary theoretical background and fundamental practices and contains extensive illustrative examples of the calculations.

G.E. Buys B-Line

NEW YORK—The General Electric Company, which purchased the B-Line Boiler Co., Cleveland, early in March, will continue to operate the factory for the present at least, for manufacturing its line of gas furnaces.

The purchase of the boiler company involved good-will, goods in process, machinery, equipment, patents and other assets of the company.

James Fitzwilliams has been placed in charge of the factory.

Perfects New Insulating Medium

URBANA, ILL.—A new insulating material has been developed here. It is "silica aerogel" and was developed by Dr. S. S. Kistler, professor of chemical engineering at the University of Illinois, where successful experiments were conducted.

"Silica aerogel" may be considered as an impalpably fine webwork of purest sand, interlocked with air and extremely light in weight.

Modernizing Show for New York

NEW YORK — The New York State Association of Master Plumbers will show real estate and building interests how the heating and plumbing in their buildings can be renovized efficiently in the Modernization Exposition of Plumbing and Heating Equipment for the Home, to be held April 16-18, at the Hotel Pennsylvania Roof, New York. The Exposition will be run concurrently with the 46th annual convention of the Association.

Henry Baetz

ST. LOUIS—Henry Baetz, inventor and formerly manufacturer of heating devices, died recently after an illness of five weeks. He was in his 70th year.

Mr. Baetz invented a unit heater in 1898 and organized the St. Louis Blower and Heater Company which manufactured his heater until 1914, when he sold out to the Skinner Bros. Mfg. Company, Inc., at which time he was made consulting engineer in charge of the heater department, a position he held until a few years ago when he retired from business.

He is survived by his widow, two sons, and two daughters.

James A. Swan

NEW YORK—James A. Swan, architectural representative in the Metropolitan New York area for Revere Copper and Brass Incorporated, died suddenly at his home in West Islip, Long Island, March 8.

Mr. Swan joined Revere in 1931 having been previously associated with Rome Brass Radiator Corporation and the American Radiator Company.

He is survived by his widow and three sons.

W. M. Chace Valve Co., 1606 Beard Ave., Detroit, has published an interesting book about thermostatic bimetal. It is profusely illustrated with photographs, diagrams, and sketches. The story of the development of thermostatic bimetal begins with the first discovery of its principle, and then traces the gradual progress down through the years to the present. A wide number of uses for thermostatic bimetal is also described; standard size, 32 pages.

Gorton Heating Corp., Cranford, N. J., has issued Bulletin 99 describing the Gorton Surevent Equalizing System.

Kewanee Boiler Corp., Kewanee, Ill., has issued a new edition No. 95a of their catalog on water heaters, garbage burners, and tanks. It includes new material on welded tanks, supplementing the riveted tank data. Details on Tabasco water heaters are also brought up-to-date.

SCHAEFER'S beer is now being brewed in an air conditioned plant in Brooklyn . . . Detroit will hold a Better Homes Show April 6-15 in Convention Hall . . . The February cold spell reached clear to the Libya plateaus of North Africa . . . But even so it wasn't as bad as the year of 1816 when New York had snow on July 4 . . . The February cold spell came simultaneously with a coal-truckdrivers' strike in Chicago . . . And in New York Mayor La Guardia rebuked city magistrates for their leniency toward those who were delivering short-weight coal.

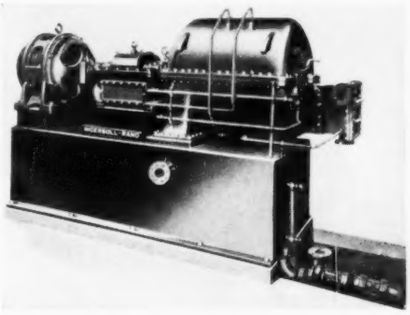
Just 100 years ago Alderman Hopkins of New York introduced a resolution that each ward inspector should make an accurate count of all new buildings in his ward at the end of the year . . . That was the beginning of building statistics . . . Which reminds us of Syracuse University's Prof. Burges Johnson, who recently put statisticians in their place by saying that "figures almost invariably lie, and mathematics is a form of sin" . . . Eastern railroads profited by the recent sub-zero weather . . . Coal loadings soared . . . But they failed to show much increase in fuel oil carried . . . Because most eastern-consumed fuel oil is shipped by tanker from Port Arthur.

The Department of Agriculture's Bureau of Chemistry and Soils has developed a belt dressing for reducing static . . . A Brooklyn plumber last month looked for a gas leak with a candle . . . An emergency squad and radio cars answered the calls of excited neighbors . . . National Radiator expects to modernize its Philadelphia showroom . . . Sears Roebuck may air condition its new building . . . St. Paul has an unemployed baker named Gus who now resides in an 18-ft. steel boiler . . . The boiler is from the Overland Building and is owned by Kenny Boiler Company . . . Its new winter air conditioner was shown by Norge Corporation at a dealers meeting in New York, March 7 . . . Air Conditioned underground buildings of unprecedented size are proposed by Professor Bucky of Columbia . . . New York subway lines are being investigated by the City for alleged failure to provide heat in the trains . . . Interior decorators have a new idea of devilish ingenuity . . . Setting boxes of wet sand with tropical plants on top of radiators . . . A device has been perfected to measure the heat of a candle 100 miles away, says a news release . . . Just the thing to measure the heat in our apartment . . . An Academy of Architecture will design all important Soviet buildings in the future . . . A 22-story skyscraper is now under construction in Moscow . . . Santa Fe Railroad this summer will have four conditioned cars on The Chief, four on the California Limited, two on The Ranger, and one on each of three other trains . . . Houses with air conditioning but no basements are being built in a Seattle real estate development . . . Located at Sheridan Beach and Lake Serene.

NEW EQUIPMENT

Centrifugal Water Vapor Refrigerating Unit

Ingersoll-Rand Co., 11 Broadway, New York City, which some time ago placed a line of steam jet refrigeration units on the market, has more recently announced a centrifugal water vapor unit. In this



Ingersoll-Rand centrifugal water vapor refrigeration unit

unit, which accomplishes the same purposes as the steam jet refrigerating machine, the evaporator is built into the base of the machine, water being admitted under return pressure and removed by a chilled water pump, as with the steam jet machine. The water vapor is compressed by the multi-stage centrifugal compressor mounted directly above the evaporator and is discharged into a small surface condenser bolted directly to the compressor discharge nozzle.

The compressor may be driven through a step-up gear by a motor or directly by a steam turbine. No speed variation is necessary for regulation and constant speed turbines or induction type motors may be employed. Turbine drive may be of either the high or low-pressure, condensing or non-condensing type, depending upon the local conditions. Turbines of unusually high efficiency can be employed because the operating speed with a direct drive turbine is most favorable for high-efficiency turbine design.

Power requirements are approximately 1 hp. per ton or less. Direct-drive turbine units especially are applicable where a limited amount of low-pressure steam is available because they will operate condensing when using the discharge water from the vapor condenser to condense the turbine steam. This type of unit is also desirable where high-pressure steam is available and exhaust steam is desired for process work.

The centrifugal-vapor unit has the feature of automatically reduced power consumption at partial loads when operating at constant speed. As the tonnage demanded decreases, the evaporation temperature goes down and the horsepower decreases approximately in proportion to the tonnage. No speed variation, hand adjustments, or special controls are needed.

Units are built in standard sizes from 50 to 300 tons of refrigeration. Ratings depend upon chilled water temperature and cover a wide field of temperature, capacity, and condensing water conditions.

Both the steam jet and centrifugal water vapor refrigeration units are described in the company's Bulletin 2083.

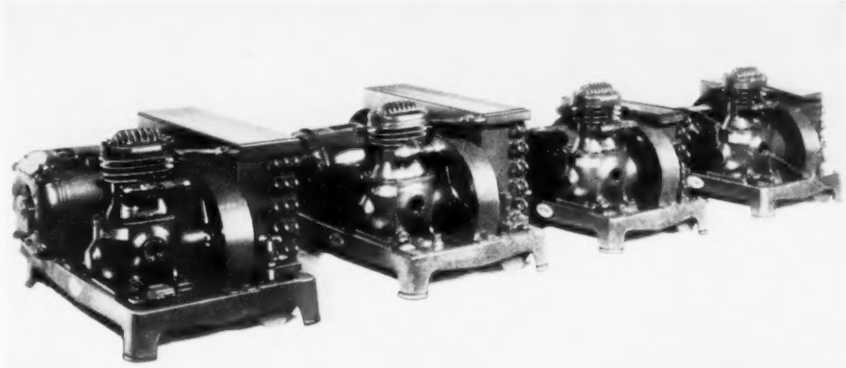
York Freon Refrigerating Units

York Ice Machinery Corp., York, Pa., through its commercial division, announces the development of a number of new and improved freon refrigerating units, in smaller sizes, ¼, 1/3, ½ and ¾ hp., which are now being placed in the hands of commercial dealers and distributors.

With the addition of these new smaller size freon units the commercial division of the company will now have available a complete line of commercial size refrigerating units, in capacities ranging from ¼ hp. to 5 hp. freon compressors, and ½ hp. to 10 hp. ammonia compressors, suitable for all types of commercial refrigeration and air conditioning applications.

Certain refinements of design have been incorporated in the smaller capacity units. The cylinders are of electric furnace nickel steel, of high tensile strength and specified hardness, doweled to the crankcase and discharge head for alignment. The outer surface of each cylinder is of special finned design for the removal of compressor heat. The crankcase is of the same material. Balanced pistons are of the double trunk type, providing cross head effect for even distribution of pressure on cylinder walls. The crank shaft is made of die-forged open-hearth steel and is unusually short and rigid in order to eliminate distortion.

The "Centriforce Oiler" delivers a constant stream of oil to the thrust bearing. Main bearings are submerged in oil; wrist pin bearings and cylinder walls are lubricated by a splash system. Motor is furnished to conform to the available current characteristics, and employs a V-belt type of drive. The condenser is of



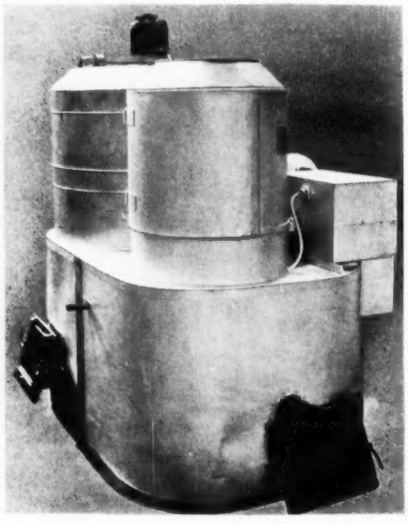
York freon cooling units

the copper-finned radiator type, with a metal casing and shield around it which deflects the flow of air drawn through the condenser by the fan.

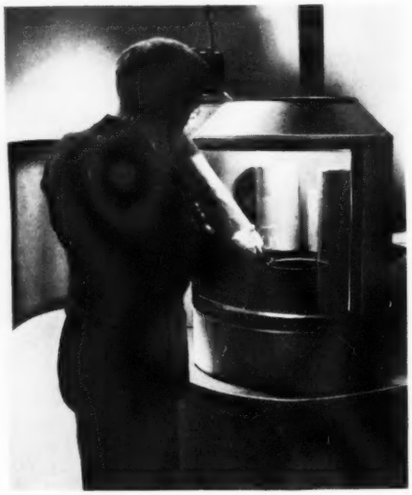
Conditionedaire Warm-Air Unit

About 30 heating engineers, combustion experts, editors, and others attended the first public showing of the Conditionedaire unit at the American Rolling Mills plant, Middletown, March 6. The unit, developed by J. R. Edwards and U. C. Thies, with Armco engineers cooperating, will not be in production for a few months.

Of the warm-air type, the device consists essentially of a furnace and gas producer combined, a heat exchange unit, and necessary accessories such as filters, blowers, motors, and controls. A feature of the unit is a circulating magazine containing six chambers which can be loaded with "sticks" of coal wrapped in paper. Each stick weighs about 20 lb., is 20 in. high, and 6 in. in diameter. The sticks are fed automatically as required, into the firepot, which is about 8 in. in diameter. In this firepot the coal is burned under forced draft circulation supplied by a small blower on top of the base. The air for combustion is first preheated to about 600° to 800° before reaching the fire, to which it is admitted through numerous small holes drilled diagonally through the firepot.



Conditionedaire. Cylinder on right is fuel magazine. To the left is the heat exchange surface



Charging "coal sticks" into the Conditionedaire

In the upper part of the firebowl the coal becomes heated and releases its volatile matter. The lower part of the furnace burns the residue in the form of coke. As the volatile gases rise to the upper part of the furnace they are drawn off through a large venturi tube that induces their flow downward by an air jet to a gas-tight ash chamber below the firebowl. Then these unburned gases pass through the grate.

The products of combustion then pass to the heat exchanger, which resembles two large funnels telescoped into each other and fastened together, the slanting sides preventing the collection of dust on the surfaces. The air passes between these funnels and out through a small hole in the top of the drum. From the top of the highest funnel the air is drawn off sideways to the smoke outlet. The temperature of the flue gases is about 115°. Water condensed from the flue gases is drained off through pipes.

Room air is recirculated through filters by means of a blower located on top of the heat exchanger and passes down on the outside of the heated funnels. The products of combustion flow upward, while air to be heated flows downward, with the house air temperature reaching its highest at the bottom of the drum. The recirculated air is then directed around the burning chamber in the other end of the equipment.

Other features of the unit include provisions for keeping the fire smoldering when the thermostat is not calling for heat, and provisions for burning gas, providing this fuel is desired rather than coal. The humidifier operates by a small jet of heated water entering the outgoing hot air flow, so that the water is broken up into a fog. Arrangement is also made for dehumidifying and cooling in the summer time.

Materials used in the unit consist mostly of Armco ingot iron plates welded together. There are but few castings used.

Controls include a thermometer and thermostat, humidistat, stack thermometer, speed regulating switch for circulating fan, a bell or light to tell when the magazine needs filling, and other warning devices and switches.

Westco Midget Return Unit

Condensation return units for steam heating systems have long been used for medium and large-sized plants. This type of equipment has been made available for small plants in the Westco Midget condensation return unit made by the Westco Pump Corp., Davenport, Iowa.

Westco Midget condensation return unit

The unit has a multi-vaned impeller which operates without metal-to-metal contact. All bronze removable liners form water channels in which the impeller rotates. The impeller shaft is of chromeplated steel and will not rust or corrode.

The receiver tank is made of heavy steel plate with all seams securely welded. The suction pipe enters the tank on the side and at a sufficient distance from the bottom to allow liberal space for the collection of sediment, which can be cleaned out through a drain opening.

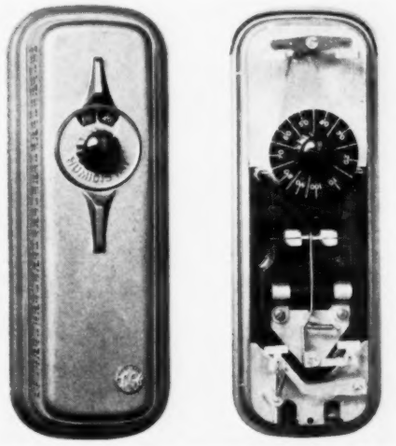
The unit has a wide operating range and considerable capacity for pumping large volumes of steam or air. The Midget unit is available in either simplex or duplex types, each with maximum capacities of 3000 sq. ft. radiation and with a 15-gal. tank.

The company also makes units with capacities up to 50,000 sq. ft.

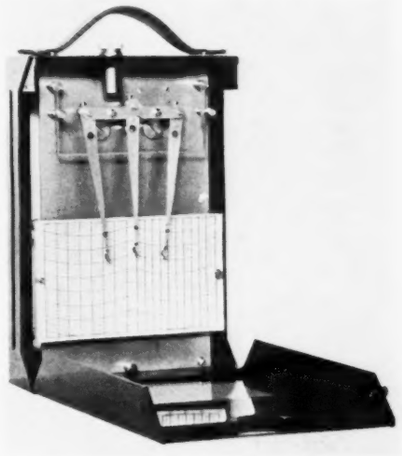
Friez Adds to Line

Two recent additions to the line of air conditioning products of Julien P. Friez & Sons, Inc., Baltimore St. & Central Ave., Baltimore, Md., are illustrated here.

Designed for field service, the Friez recorder is compact and easily portable and should be valuable in all test, sales, and service work. It provides a simultaneous running record of all functions of heating, cooling, humidifying, dehumidifying, and the number and duration of



Improved Friez humidistat



Friez recorder for temperature and humidity vs. time

cycles of operation of the equipment, inscribed on charts of index file card type. The time coordinates for temperature, humidity, and operation coincide, giving a ready comparison of these functions. The standard instrument provides 30-hr. records, and a recorder for 10-hr. records is available. The case is fitted with a leather handle and unbreakable observation window.

The new humidistat combines improved appearance with refinements in design. It is for process or comfort application, controlling solenoid valves, motor valves, damper motors, etc., at either low or line voltage. A hygroscopic element of human hair provides a high degree of sensitivity and is said by the manufacturer to control the humidity accurately within a 1% differential. A knob and rotating dial setting permits regulation between 10% and 100%. The case is constructed of aluminum, finished in the new Alumilite finish in polished bronze or satin silver.

Aluminum Paint for Refractories

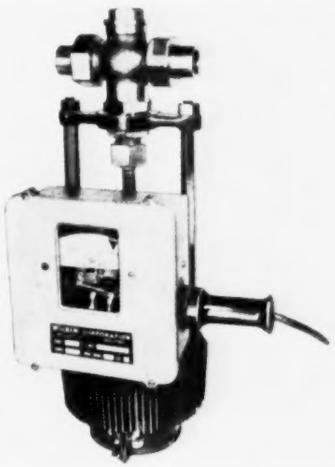
The Relinus Co., Hempstead, N. Y., has developed a heat-resisting aluminum paint for refractories that will stand 1500° without fading. The paint has been developed especially for firebricks.

The paint forms a super-refractory coat of high volumetric stability and has a valuable application in oil burner and firebox installations where resistance against pitting action due to high-pressure flame is desired.

Wilbin Temperature Regulators

Wilbin Instrument Corp., 40 East 34th St., New York, has placed on the market a line of electric temperature regulators, including automatic valves for steam, gas, oil, water, or brine flow control, actuated by thermostats of various kinds.

Instead of the conventional rotary motor, a "heat motor" is employed to operate the valve. This motor consists of a pressure chamber in which volatile fluid is vaporized by an electric strip heater. The vapor pressure built up compresses a flexible bellows in the chamber. The valve plunger is attached to this bellows and is moved upwards when the bellows is compressed. Limit switches, actuated by the valve stem itself, control and reverse the valve stroke. An ingenious device for interrupting the electric circuit makes it possible to arrest the valve travel at any point between the "open" and "closed" positions. It is claimed that six different valve positions can be secured for a total temperature difference at the thermostat of only 10°. This makes possible close control of temperatures even where fluctuations occur rapidly over wide limits.

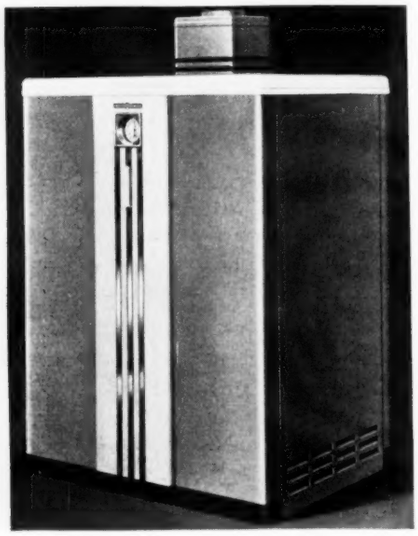


Wilbin heat motor valve, Type C

Combinations are available for process industries, refrigeration, air conditioning, weather and zone control of heating systems, and room control.

G.E. Gas Boilers

A line of gas boilers is now offered by the General Electric Co., Schenectady, N. Y., covering a wide range of capacities. These boilers cover three types: Series RM for small residences; Series RK for larger residences, and Series CK for commercial installations where the total boiler load ranges from 475,000 to 2,333,000 B.t.u. per hr. Each series will be available for steam, vapor, or gravity hot water systems in several different sizes, the proper size depending on specific requirements.



G.E. gas boiler

An Aid in Pipe Welding

Wedge Protectors, Inc., 3599 E. 82nd St., Cleveland, is manufacturing Wedge split chill rings which aid in aligning pipe, save welding material, eliminate icicles, and assure a clean joint when welding piping. The ring is split, which allows it to spring and adjust itself firmly on the inside of a joint regardless of variation in inside diameter of the pipe.

A feature of the ring is that at the contact points of the ring with the pipe it has a slight bevel to allow easy approach in the pipe and a flat surface next to the bead so that the ring will not spring out, but will be held in place. The thickness of the ring is such that it causes little resistance to flow and yet is of adequate strength to center and line up the pipe, and is thick enough not to burn through.

These rings are carried in stock for all standard pipe sizes to 20 in.

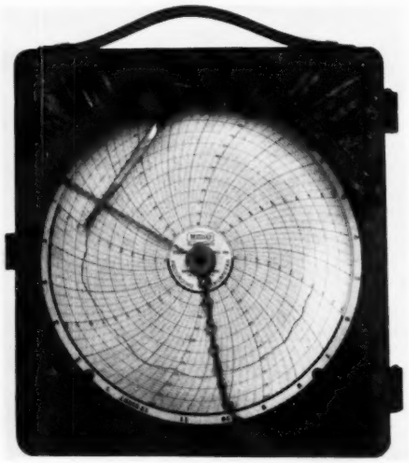
This manufacturer also markets Wedge Protectors, caps for fitting over the end of pipe, tubing, fingers, etc., for protecting the thread while the pipe is being shipped or undergoing rough handling.

Recording Thermometer for Air Conditioning Plant

A recording thermometer, Model 500, is one of the new products of Moto Meter Gauge & Equipment Corp., La Crosse, Wis. The instrument is designed particularly for air conditioning equipment.

The thermometer has a 6-in. easy reading, evenly calibrated chart, and is made in both portable and wall-mounting types. Its element consists of a bulb, capillary tube, and a Bourdon tube, filled solidly with a special liquid. When the bulb is subjected to heat or cold the liquid content therein expands or contracts, and this action is transmitted through the capillary tube to the Bourdon tube, causing the latter to unwind or wind, and, in so doing, to move the pen across the chart.

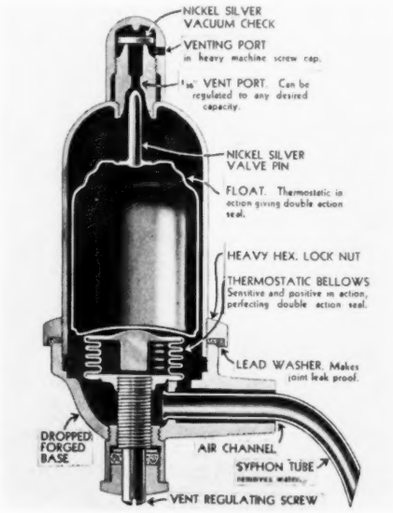
The device can be equipped with any type of capillary tubing suitable for any particular installation. Charts are available in a wide number of ranges and sub-divisions.



Motoco Model 500 recording thermometer

Radiator Vent Controls Temperatures

Anderson Manufacturing Co., 195 Albany St., Cambridge, Mass., has introduced the Vent-Rite radiator air valve, designed to balance the radiators in a one-pipe steam system.


NICKEL SILVER VACUUM CHECK
VENTING PORT in heavy machine screw cap.
VENT PORT. Can be regulated to any desired capacity.
NICKEL SILVER VALVE PIN
FLOAT. Thermostatic in action giving double action seal.
HEAVY HEX. LOCK NUT
THERMOSTATIC BELLOWS Sensitive and positive in action, perfecting double action seal.
LEAD WASHER. Makes joint leak proof.
DROPPED FORGED BASE
AIR CHANNEL
SYPHON TUBE
VENT REGULATING SCREW

Vent-Rite radiator air valve

This balancing is accomplished by controlling the distribution of the steam by increasing or decreasing the venting capacity of each air valve. Adjustment is effected by a regulating screw located in the bottom of the vent by means of which the thermostatic bellows is moved nearer to, or away from, the valve seat. This makes it possible to induce heat in one radiator and repel it from another at will.

Kennedy Globe and Angle Valves

A new line of heavy standard bronze globe and angle valves is being offered by The Kennedy Valve

Mfg. Co., Elmira, N. Y., with several improvements in design.

A feature of these valves is the cadmium plating of the malleable iron union bonnet ring and stuffing box nut. The cadmium plating will not chip or wear off, adds to the appearance of the valves, and affords protection against rusting. The union bonnet ring construction is used.

A feature is the design of the bearing surface between the stem and the disc holder. The stem head has a rounded, machined, bottom surface which makes a low-friction

Kennedy heavy standard bronze globe valve

bearing contact with a smooth milled recess in the disc holder. This reduces the friction, and also makes it easier to start the valve open and to close the valve to a tight position.

Additional features include: the raised seat in the body is unusually high, which increases the distance which the disc must wear down before the rim of the disc holder strikes the metal at the base of the raised seat; the slip-on disc holder is designed to lock on the stem at a definite position; a half turn of the stem releases the disc holder; the valves can be repacked under pressure, and the packing nut is exceptionally long, adding to the life of the packing.

The valves are known as the Fig. 89 globe valve and Fig. 90 angle valve. They are made in a full range of sizes from ¼ in. to 3 in., suitable for 150 lb. w.s.p.

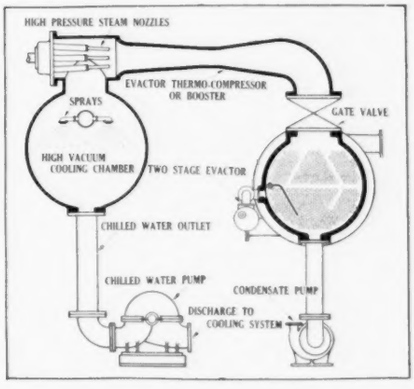
Croll-Reynolds Evactor

Croll-Reynolds Co., Inc., 17 John St., New York, some time ago placed on the market the Evactor, a steam jet refrigerating system.

The Evactor consists of a thermal compressor, a high vacuum cooling chamber, a condenser, and accessory parts. Steam is supplied to the thermal compressor. The flow of the steam through the compressor builds up a vacuum in the cooling chamber so that the water contained there boils at a low temperature. The vapor passes through the compressor and the cooled water remaining is circulated to the heat exchange surface used in connection with refrigerating or air conditioning.

After passing through the thermal compressor, the steam is condensed in a surface condenser.

Many variations in the apparatus may be made to meet individual conditions. Two or more Thermo-Compressors may be used in parallel to permit maximum efficiency and flexibility in handling varying loads. A surface condenser may be substituted in place of the barometric condenser shown where operating conditions or location make it desirable. Also an Evactor having a surface intercooler and aftercondenser may be used or a steam or motor-driven reciprocating vacuum pump. The number and arrangement of cooled water pumps, condensate pumps, injection or circulating water pumps depend on economical and operating conditions and must be worked out for each

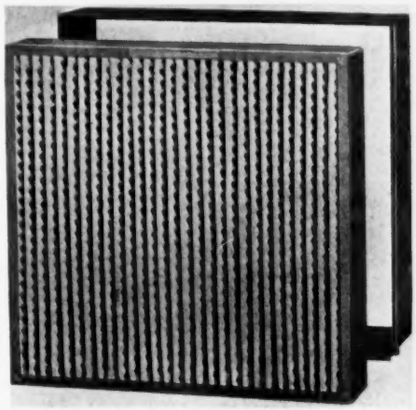


Typical arrangement of Evactor with surface condenser

particular installation. These and other considerations make it impractical to offer completely standardized systems. Evactor systems are assembled largely from standardized parts manufactured in the company's shops.

American Airmat Drifilter

American Air Filter Co., Inc., Louisville, Ky., has introduced a new type of renewable or throw-away filter called the Airmat Drifilter for which is claimed the same high efficiency as standard Airmat filters with the added advantage of low



Type K American Airmat Drifilter

first cost and inexpensive maintenance.

Drifilter element, or cell, is made of a continuous sheet of 6-ply Airmat filtering material folded back and forth over corrugated spacers and securely encased in a heavy cardboard channel section. This construction makes it possible to obtain approximately 30 sq. ft. of filtering area in a single unit 20 in. square by 4 in. deep. After the cell has accumulated its full dust load, it is discarded and replaced with a clean cell.

The unit consists of a filter element and a permanent metal frame. The frame is provided with clips for holding the filter cell in place and arranged for bolting adjacent frames together to form an installation of any desired capacity. Each unit is rated at 600 to 800 c.f.m., depending upon the amount of dust in the air. The initial resistance at 600

c.f.m. is 0.10 in. and at 800 c.f.m., 0.185 in. w.g. The shipping weight for a complete unit is 22 lb., and for a Drifilter cell 6 lb.

Metal-Covered Sound Insulation for Ductwork

A silencing treatment for air ducts, consisting of perforated metal backed by sound-absorbing acoustical material, has been developed by the Burgess Battery Co., 111 West Monroe St., Chicago. The manufacturer states that this type of sound insulation effectively absorbs blower and air rushing noises in ducts without affecting the volume of air flow.

Perforations in the metal covering, although having a small aggregate area, allow the sound waves propagated in the air stream to penetrate freely into the absorbing material, which dampens the pressure pulsations and renders the disturbance inaudible. The metal surface provides a frictionless passage for the air and retains the absorbing material in place, preventing high velocity air from carrying it away.

Electrol-American Air Conditioner

The Electrol-American air conditioner was shown publicly for the first time at the recent Oil Burner Show in Philadelphia. The conditioner is built by the American Blower Corporation for Electrol Incorporated.

This conditioner is made in two types and four sizes, with capacities making it available for installations ranging from homes to small commercial jobs. The series H conditioner was designed primarily for winter air conditioning and provides heating, humidification, cleaning, and circulation.

Series CH models are identical in appearance and construction with those of Series H, but contain, in addition, a refrigerating coil and a patented damper arrangement which permit both a definite cooling and dehumidifying of the air in the summer.

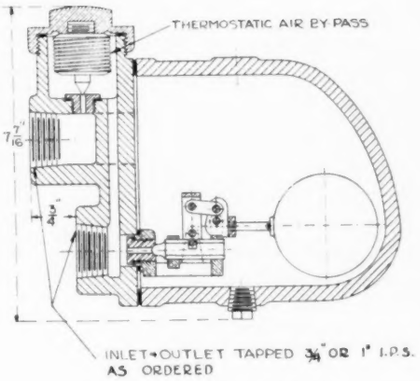
Series H is available in four sizes, with heating capacities ranging from 107,000 to 312,000 B.t.u. per hr. gross output, based on 2-lb. steam pressure. Series CH, available with four sizes of refrigerating machines, have cooling capacities from 24,850 to 62,100 B.t.u. per hr., with condenser water requirements of 2.69 to 6.73 g.p.m.

Sarco Combination Float-Thermostatic Trap

An addition has been made to the line of steam traps manufactured by Sarco Company, Inc., 183 Madison Ave., New York. The device is a combination float thermostatic trap, Type FTO-H, and has working pressures to 180 lb. per sq. in.

The trap is compact in design and light in weight and can be supported directly on the piping. Inlet and outlet are on the same side, a small vertical distance apart for easy connection to horizontal pipes. All working parts are on the cover and can be exposed for cleaning by removing the trap body, without disturbing the connections.

The automatic air by-pass is arranged on the down-board side of the trap so that the thermostatic element is not exposed to the full steam pressure. It will keep the trap vented at all times so that it cannot become air-bound. The main discharge valve and seat are of stainless steel for long life and freedom from scoring.



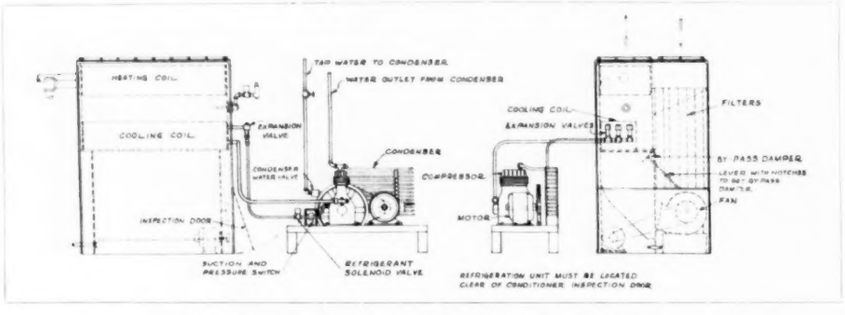
Sarco Type FTO-H trap

Available with three different sized seats, capacities range from 1900 to 2100 lb. of water per hour.

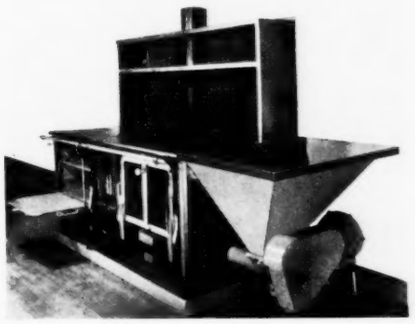
Burner-Fired Range

Bramhall, Deane & Co., New York, range manufacturers, in conjunction with Electric Furnace-Man, Inc., 7 Dey St., New York, has introduced the first restaurant range designed throughout for firing with an automatic anthracite burner. Stokers have been used to a considerable extent in the past in connection with ranges, but such jobs have been conversion installations. The new E.F.-M. unit, of steel, designated as a 6-ft. range, operates with greater efficiency than conversion jobs, and is well insulated throughout with insulation backed by heavy boiler plate.

The burner is the Electric Furnace-Man Type JR, with the exception of the hopper which was designed especially for this unit so that the top will line up with the top of the range. This allows a 2-sq. ft. work table on the end of the range, fitting over the top of the hopper. The burner can be installed at either the right or left end of the range. The burner uses rice anthracite, and the hopper will hold 100 lb. of this fuel.



Electrol-American air conditioner, Series CH.



Burner-fired range with Type JR Electric Furnace-Man

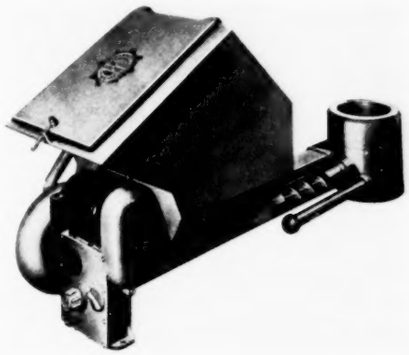
Although the original price of the range is high as compared with gas or electric types, operating costs are considerably less. Operating 24 hr. per day and at maximum capacity for 6½ hr. per day, with rice anthracite at $7 per ton, and electricity at 5c per kw-hr., the operating costs are 56c per day.

Link-Belt Adds Domestic Stoker

After field tests and development work covering many months, Link-Belt Co., 910 S. Michigan Ave., Chicago, announces the addition of a domestic unit to its line of underfeed screw-type stokers. This rounds out the company's line to a total of 10 sizes, to cover the entire range of boiler capacities from the home size up to 250 boiler hp.

The design includes new features in mounting, transmission, and coal burning. The hopper is extra large, having a coal capacity of 500 lb. The height of the hopper is 26 in. above floor level, which makes for easy filling. The transmission is fully enclosed, is provided with positive lubrication, and arranged for five speeds. Gears may be shifted clashlessly while in operation.

Other features include: accessible cleanout door, smoke arrester, conveniently located retort cleanout, fan silencer, and easily replaceable shear pin.



Link-Belt underfeed domestic stoker

Monobelt Designed for Severe Service

Due to the high speeds used in modern belt-driven equipment, often necessitating a small pulley on any driven mechanism, the requirements for leather belting have become much more severe. Not only is the area of contact between belt and pulley reduced but the belt is subjected to sharp and frequent bends. To overcome this problem Alexander Brothers, 406 N. Third St., Philadelphia, have introduced Monobelt.

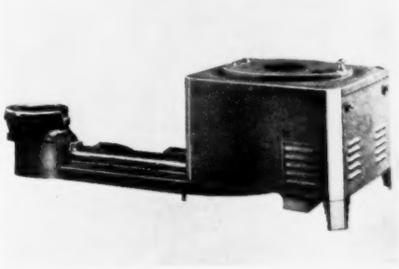
In the construction of this new belt, specially-prepared vegetable tanned leather having a high adhesion and thoroughly stretched by a special process is used. The stretch is accurately regulated in each piece of leather. In single-ply belts, leather with a minimum of stretch is used. In double-ply belts, the pulley side of the belt is made of the same leather as the single ply, but the outer ply is made of more elastic leather; that is, leather having more elastic stretch than the inner ply. By using such construction, the internal friction is considerably reduced.

This type belt is not recommended for use where a belt is subjected to a reverse flexing.

The new belt is made in only one standard thickness for each width.

Butler Small House Stoker

Intended for the small house field, the home-size Butler automatic coal burner No. 25, was recently announced. The unit, manufactured by the Butler Manufacturing Co., Kansas City, Mo., is an underfeed burner designed similarly to the company's large-size burners. Air and coal ducts are cast in one piece. A retort of special design supplies air through ports so as to obtain good combustion with free-burning coal. The feed screw is made of nickel cast iron. Retorts are designed for 17 in. round or 10 in. by 15 in. rectangular fire boxes, and larger sizes.



Home-size Butler automatic coal burner

The new unit comes complete with thermostat, stoker switch, relay, and circuit breaker for warm-air furnaces where necessary. It is priced to retail under $250.

Arco Copper Fittings

To make it possible to avoid the use of cast alloy metal at vital points in copper piping installations, American Radiator Co., New York, has placed on the market the first integral wrought copper tee and a threaded wrought copper elbow.

These two fittings are being added to the regular line of Arco copper pipe and fittings, together with a red brass gate valve especially designed to give a full flow. All three of the fittings are made in sizes up to 1 in., and the tee is supplemented by the Arco cast tee in 1¼ in. to 2 in. sizes. The new wrought copper elbow is made for both male and female as well as most standard reduction connections.

Arco wrought copper tee and elbow and red brass gate valve

Half of Country Colder, Half Warmer This Winter

February, 1934

	Atlanta	Baltimore	Birmingham	Boston	Buffalo	Chicago	Cincinnati	Cleveland
Degree-days for February, 1934	700	1138	594	1332	1493	1178	1112	1340
Degree-days, Sept. 1, 1933 to Feb. 28, '34	2212	3611	1776	4853	5296	4475	3835	4482
Degree-days, Sept. 1, 1932 to Feb. 28, '33	2247	2980	1997	3568	4317	4393	3633	3867
Comparison, season to date with last, %	— 1.6	+ 21.2	— 11.1	+ 36.0	+ 22.6	+ 1.9	+ 5.6	+ 15.9
Degree-days, Sept. 1 to Feb. 28, Normal	2370	3462	2079	3280	4767	4582	3666	4440
Comparison, season to date with nor'l, %	— 6.7	+ 4.3	— 14.5	+ 48.0	+ 11.1	— 2.3	+ 4.6	+ 0.9
Lb. coal per sq. ft. rad., February, 1934	5.600	9.104	4.752	10.656	11.944	9.424	8.896	10.720
Gal. oil per sq. ft. rad., February, 1934	0.480	0.780	0.407	0 913	1.024	0.808	0.762	0.919
Cu. ft. gas per sq. ft. rad., February, 1934	67.20	109.25	57.02	127.87	143.33	113.09	106.75	128.64

	Davenport	Dayton	Denver	Des Moines	Detroit	Duluth	Fort Wayne	Grand Rapids
Degree-days for February, 1934	1151	1176	796	1074	1404	1561	1297	1378
Degree-days, Sept. 1, 1933 to Feb. 28, '34	4524	4158	3078	4575	4907	7013	4681	5011
Degree-days, Sept. 1, 1932 to Feb. 28, '33	4575	3826	4411	4916	4408	6919	4380	4580
Comparison, season to date with last, %	— 1.1	+ 8.7	— 30.2	— 6.9	+ 11.3	+ 1.4	+ 6 9	+ 9.4
Degree-days, Sept. 1 to Feb. 28, Normal	4825	4043	4273	4935	4719	6634	4512	4863
Comparison, season to date with nor'l, %	— 6.2	+ 2.8	— 28.0	— 7.3	+ 4.0	+ 5.7	+ 3 7	+ 3.0
Lb. coal per sq. ft. rad., February, 1934	9.208	9.408	6.368	8.592	11.232	12.488	10.376	11.024
Gal. oil per sq. ft. rad., February, 1934	0.789	0.806	0.546	0.736	0.963	1.070	0.889	0.945
Cu. ft. gas per sq. ft. rad., February, 1934	110.50	112.90	76.42	103.10	134.78	149.86	124.51	132.29

	Harrisburg	Hartford	Indianapolis	Kansas City	La Crosse	Los Angeles	Louisville	Memphis
Degree-days for February, 1934	1222	1358	1161	882	1252	158	984	697
Degree-days, Sept. 1, 1933 to Feb. 28, '34	4324	4922	4108	3383	5411	728	3378	2272
Degree-days, Sept. 1, 1932 to Feb. 28, '33	3708	3904	3966	3806	5569	940	3270	2511
Comparison, season to date with last, %	+ 16.6	+ 26.0	+ 3.6	— 11.1	— 2.8	— 22.6	+ 3 3	— 9.5
Degree-days, Sept. 1 to Feb. 28, Normal	4077	4416	4099	4216	5579	1016	3327	2470
Comparison, season to date with nor'l, %	+ 6.0	+ 11.5	Same	— 19.8	— 3.0	— 28.4	+ 1.5	— 8.0
Lb. coal per sq. ft. rad., February, 1934	9.776	10.864	9.288	7.056	10.016	1.264	7.872	5.576
Gal. oil per sq. ft. rad., February, 1934	0.838	0.931	0.796	0.605	0.858	0.108	0.675	0.478
Cu. ft. gas per sq. ft. rad., February, 1934	117.31	130.368	111.46	84.67	120.19	15.17	94.46	66.91

	Milwaukee	Minneapolis	New Haven	New Orleans	New York	Omaha	Peoria	Philadelphia
Degree-days for February, 1934	1236	1303	1334	262	1266	983	1153	1199
Degree-days, Sept. 1, 1933 to Feb. 28, '34	4912	5788	4651	690	4230	4192	4390	3809
Degree-days, Sept. 1, 1932 to Feb. 28, '33	4851	5957	3735	963	3375	4582	4413	3039
Comparison, season to date with last, %	+ 1.2	— 2.8	+ 24.6	— 28.4	+ 25.3	— 8.5	— 5.2	+ 25.4
Degree-days, Sept. 1 to Feb. 28, Normal	5185	5950	4230	965	3870	4765	4673	3629
Comparison, season to date with nor'l, %	— 5.3	— 2.7	+ 9.9	— 28.5	+ 9.3	— 12.0	— 6.1	+ 5.0
Lb. coal per sq. ft. rad., February, 1934	9.888	10.424	10.672	2.096	10.128	7.864	9.224	9.592
Gal. oil per sq. ft. rad., February, 1934	0.848	0.893	0.915	0.180	0.868	0.674	0.791	0.822
Cu. ft. gas per sq. ft. rad., February, 1934	118.66	125.09	128.06	25.15	121.54	94.37	110.69	115.10

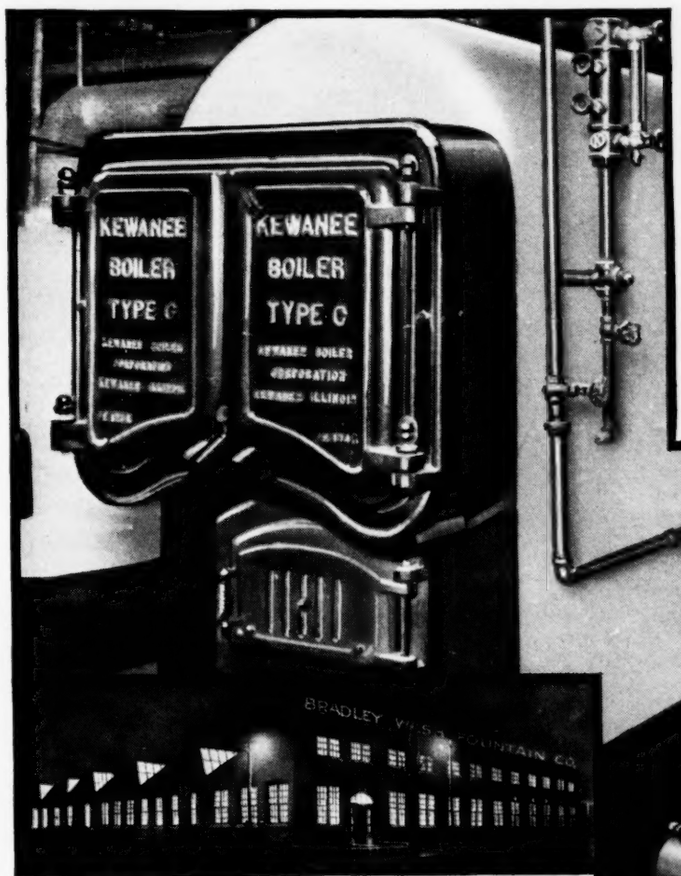
	Pittsburgh	Portland, Ore.	Providence	Reading	Rochester	St. Louis	Salt Lake City	San Francisco
Degree-days for February, 1934	1269	440	1333	1230	1467	941	616	261
Degree-days, Sept. 1, 1933 to Feb. 28, '34	4291	2537	4784	4178	5260	3384	3229	1532
Degree-days, Sept. 1, 1932 to Feb. 28, '33	3698	3161	3729	3539	4204	3456	4670	1838
Comparison, season to date with last, %	+ 16 0	— 19.7	+ 28.3	+ 18.1	+ 25.1	— 2.1	— 30.8	— 16.6
Degree-days, Sept. 1 to Feb. 28, Normal	3947	3174	4315	4082	4825	3652	4144	1770
Comparison, season to date with nor'l, %	+ 8.7	— 20.0	+ 11.9	+ 2.4	+ 9.0	— 7.3	— 22.1	— 13.5
Lb. coal per sq. ft. rad., February, 1934	10.152	3.520	10.664	9.840	11.736	7.528	4.928	2.088
Gal. oil per sq. ft. rad., February, 1934	0.870	0.302	0.914	0.843	1.006	0.645	0.422	0.179
Cu. ft. gas per sq. ft. rad., February, 1934	121.82	42.24	127.97	118.08	140.83	90.34	59.14	25.06

	Scranton	Seattle	Spokane	Syracuse	Toledo	Trenton	Washington, D. C.	Wichita
Degree-days for February, 1934	1387	456	718	1483	1348	1303	1130	761
Degree-days, Sept. 1, 1933 to Feb. 28, '34	4946	2789	3854	5331	4747	4349	3640	3030
Degree-days, Sept. 1, 1932 to Feb. 28, '33	4059	3332	4697	4132	4319	3476	3096	3598
Comparison, season to date with last, %	+ 21.8	— 16.3	— 15.8	+ 29.0	+ 9.9	+ 25.1	+ 17.6	— 15.8
Degree-days, Sept. 1 to Feb. 28, Normal	4552	3309	4707	4980	4465	3715	3559	3773
Comparison, season to date with nor'l, %	+ 8.7	— 15.7	— 18.1	+ 7.0	+ 6.3	+ 17.1	+ 2.3	— 19.7
Lb. coal per sq. ft. rad., February, 1934	11.096	3.648	5.744	11.864	10.784	10.424	9.040	6.088
Gal. oil per sq. ft. rad., February, 1934	0.951	0.313	0.492	1.017	0.924	0.893	0.775	0.522
Cu. ft. gas per sq. ft. rad., February, 1934	133.15	43.78	68.93	142.37	129.41	125.09	108.48	73.06

Fuel consumption figures given above are based on certain conditions, and for other conditions corrections must be made. The figures assume the use of steam radiators emitting 240 B.t.u. per sq. ft. per hr., a system operating at 100% efficiency, and radiators calculated for maintaining 70° in zero weather. Heating values assumed for the fuels are 12,000 B.t.u. per lb. for coal, 1000 B.t.u. per cu. ft. for gas, and 140,000 B.t.u. per gal. for oil. To correct for other heating values, efficiencies, and design conditions, follow the method explained in the "Heating and Ventilating Degree-Day Handbook."

"IRON FIREMAN *cut our fuel costs* $1147.80 or 76% in one year"

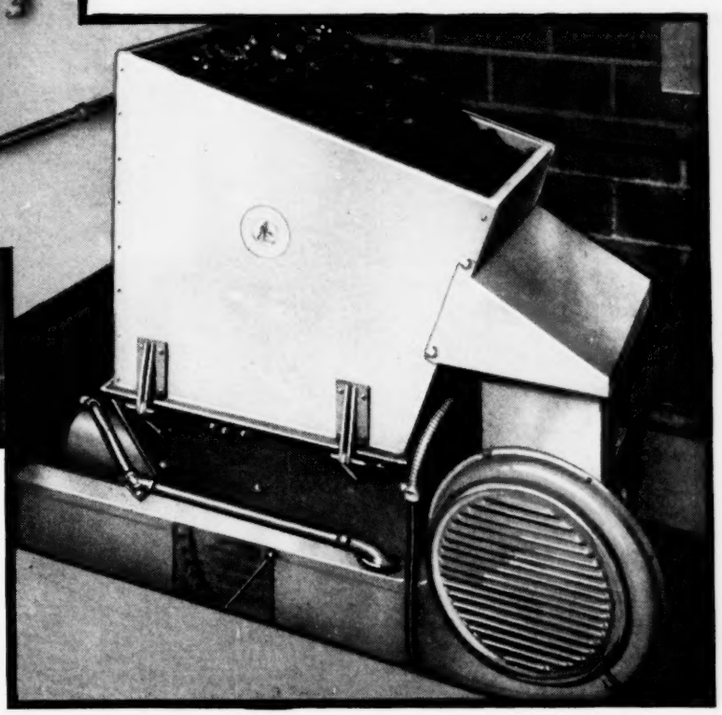
says Howard A. Mullett, President, Bradley Washfountain Co., Milwaukee, Wis.



Bradley Washfountain Company plant and its Iron Fireman installation

An Iron Fireman Automatic Coal Burner replaced another kind of automatic firing at the Bradley Washfountain Company. In the first year of operation the machine more than paid for itself from fuel savings. The second year it earned its owners $1147.80. "In addition to saving this sum and providing the factory with uniform heat, Iron Fireman has operated efficiently and without interruption in firing service," says Mr. Mullett.

This Iron Fireman record is duplicated in thousands of heating plants. When you buy an Iron Fireman you get a machine that cuts fuel costs, maintains steady, even heat, eliminates smoke nuisance and increases plant efficiency. In addition, you deal with a company that is the pioneer and largest manufacturer in its field, and whose leadership in design, engineering, construction and responsibility of service is firmly established.



IRON FIREMAN SURVEY SERVICE

To management, plant and consulting engineers, and others who are directly responsible for securing maximum efficiency at lowest cost from commercial and industrial heating boilers up to 250 h. p., this company and its authorized dealers will gladly make a survey and report on the fuel savings and improvements that can be expected when Iron Fireman replaces present firing methods. Use the coupon below or telephone the nearest authorized Iron Fireman dealer. There is no charge or obligation for this service. Iron Fireman Mfg. Co., Portland, Oregon; Cleveland, Ohio; Toronto, Canada.

IRON FIREMAN

AUTOMATIC *Self Regulating* COAL FIRING

IRON FIREMAN MFG. CO.
3170 W. 106th Street, Cleveland, Ohio.

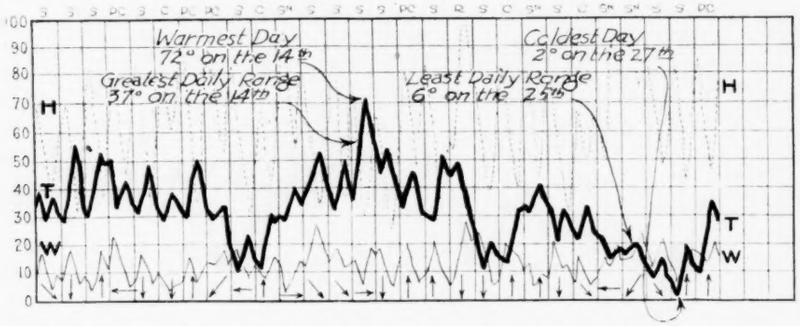
☐ Send literature ☐ Please survey my heating plant

Name.....

Address.....HV-2

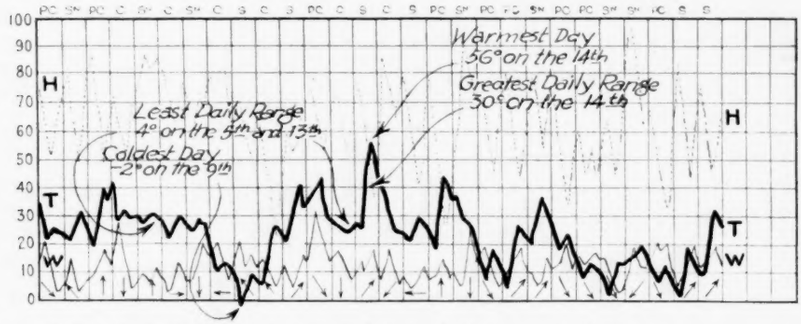
THE WEATHER FOR FEBRUARY, 1934

Plotted from records especially compiled for HEATING AND VENTILATING by the U. S. Weather Bureau. Heavy curves (T), temperatures in deg. F.; dotted lines (H), per cent relative humidity, from readings at 8 a.m., noon, and 8 p.m., except for New York, which shows hourly readings. Light lines (W), wind velocity in m.p.h. Arrows indicate prevailing wind directions. S—clear; PC—partly cloudy; C—cloudy; R—rain; Sn—snow.



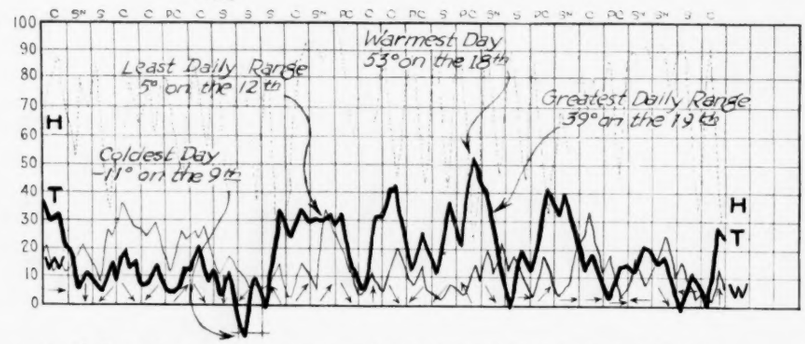
St. Louis

Mean temp. for month, 31.4°; aver. wind velocity, 11.8 m.p.h.; prevailing direction of wind, S.



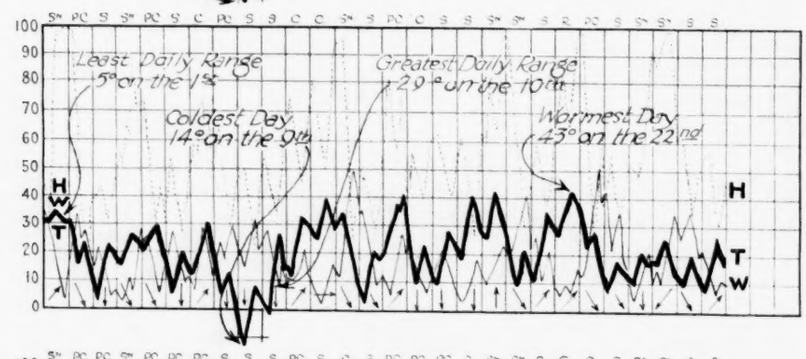
Chicago

Mean temp. for month, 22.9°; aver. wind velocity, 11.3 m.p.h.; prevailing direction of wind, N.W.



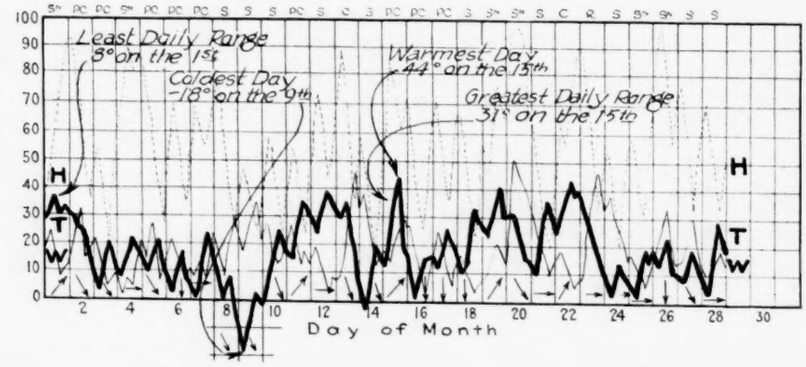
Pittsburgh

Mean temp. for month, 19.7°; aver. wind velocity, 10.2 m.p.h.; prevailing direction of wind, W.



New York

Mean temp. for month, 19.8°; aver. wind velocity, 16.5 m.p.h.; prevailing direction of wind, N.



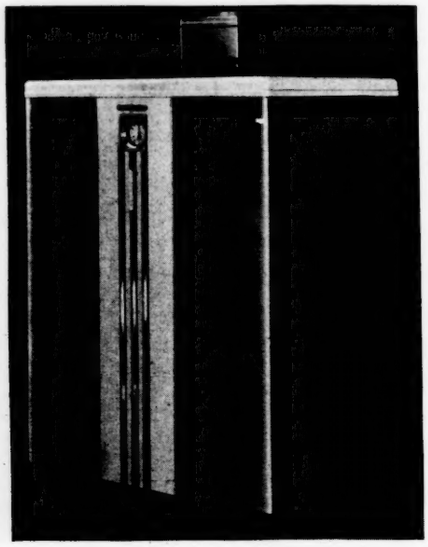
Boston

Mean temp. for month, 17.5°; aver. wind velocity, 16.7 m.p.h.; prevailing direction of wind, N.W.

Combinations are available for process industries, refrigeration, air conditioning, weather and zone control of heating systems, and room control.

G.E. Gas Boilers

A line of gas boilers is now offered by the General Electric Co., Schenectady, N. Y., covering a wide range of capacities. These boilers cover three types: Series RM for small residences; Series RK for larger



G.E. gas boiler

residences, and Series CK for commercial installations where the total boiler load ranges from 475,000 to 2,333,000 B.t.u. per hr. Each series will be available for steam, vapor, or gravity hot water systems in several different sizes, the proper size depending on specific requirements.

An Aid in Pipe Welding

Wedge Protectors, Inc., 3599 E. 82nd St., Cleveland, is manufacturing Wedge split chill rings which aid in aligning pipe, save welding material, eliminate icicles, and assure a clean joint when welding piping. The ring is split, which allows it to spring and adjust itself firmly on the inside of a joint regardless of variation in inside diameter of the pipe.

A feature of the ring is that at the contact points of the ring with the pipe it has a slight bevel to allow easy approach in the pipe and a flat surface next to the bead so that the ring will not spring out, but will be held in place. The thickness of the ring is such that it causes little resistance to flow and yet is of adequate strength to center and line up the pipe, and is thick enough not to burn through.

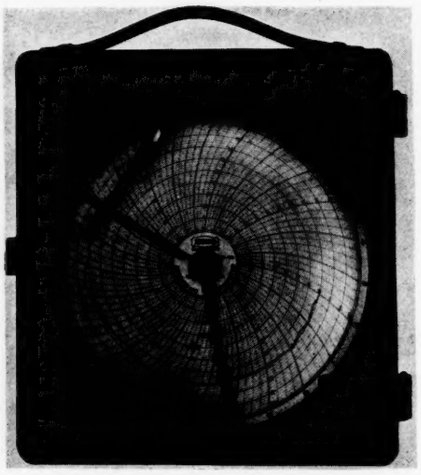
These rings are carried in stock for all standard pipe sizes to 20 in.

This manufacturer also markets Wedge Protectors, caps for fitting over the end of pipe, tubing, fingers, etc., for protecting the thread while the pipe is being shipped or undergoing rough handling.

Recording Thermometer for Air Conditioning Plant

A recording thermometer, Model 500, is one of the new products of Moto Meter Gauge & Equipment Corp., La Crosse, Wis. The instrument is designed particularly for air conditioning equipment.

The thermometer has a 6-in. easy reading, evenly calibrated chart, and is made in both portable and wall-mounting types. Its element consists of a bulb, capillary tube, and a Bourdon tube, filled solidly with a special liquid. When the bulb is subjected to heat or cold the liquid content therein expands or contracts, and this action is transmitted through the capillary tube to the Bourdon tube, causing the latter to unwind or wind, and, in so doing, to move the pen across the chart.

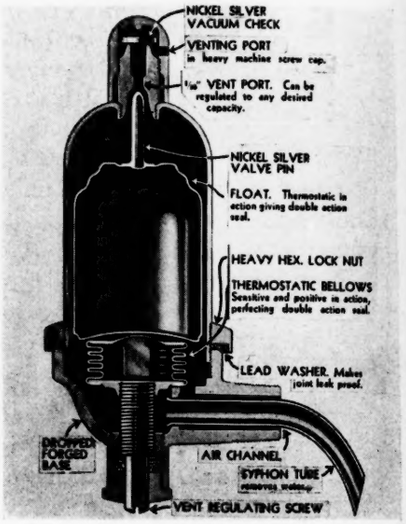


Motoco Model 500 recording thermometer

The device can be equipped with any type of capillary tubing suitable for any particular installation. Charts are available in a wide number of ranges and sub-divisions.

Radiator Vent Controls Temperatures

Anderson Manufacturing Co., 195 Albany St., Cambridge, Mass., has


NICKEL SILVER VACUUM CHECK
VENTING PORT in heavy machine screw cap.
VENT PORT. Can be regulated to any desired capacity.
NICKEL SILVER VALVE PIN
FLOAT. Thermostatic in action giving double action seal.
HEAVY HEX. LOCK NUT
THERMOSTATIC BELLOWS Sensitive and positive in action, perfecting double action seal.
LEAD WASHER. Makes joint leak proof.
DROP FORGED BASE
AIR CHANNEL
SYPHON TUBE
VENT REGULATING SCREW

Vent-Rite radiator air valve

introduced the Vent-Rite radiator air valve, designed to balance the radiators in a one-pipe steam system.

This balancing is accomplished by controlling the distribution of the steam by increasing or decreasing the venting capacity of each air valve. Adjustment is effected by a regulating screw located in the bottom of the vent by means of which the thermostatic bellows is moved nearer to, or away from, the valve seat. This makes it possible to induce heat in one radiator and repel it from another at will.

Kennedy Globe and Angle Valves

A new line of heavy standard bronze globe and angle valves is being offered by The Kennedy Valve

Mfg. Co., Elmira, N. Y., with several improvements in design.

A feature of these valves is the cadmium plating of the malleable iron union bonnet ring and stuffing box nut. The cadmium plating will not chip or wear off, adds to the appearance of the valves, and affords protection against rusting. The union bonnet ring construction is used.

A feature is the design of the bearing surface between the stem and the disc holder. The stem head has a rounded, machined, bottom surface which makes a low-friction

Kennedy heavy standard bronze globe valve

bearing contact with a smooth milled recess in the disc holder. This reduces the friction, and also makes it easier to start the valve open and to close the valve to a tight position.

Additional features include: the raised seat in the body is unusually high, which increases the distance which the disc must wear down before the rim of the disc holder strikes the metal at the base of the raised seat; the slip-on disc holder is designed to lock on the stem at a definite position; a half turn of the stem releases the disc holder; the valves can be repacked under pressure, and the packing nut is exceptionally long, adding to the life of the packing.

The valves are known as the Fig. 89 globe valve and Fig. 90 angle valve. They are made in a full range of sizes from ¼ in. to 3 in., suitable for 150 lb. w.s.p.

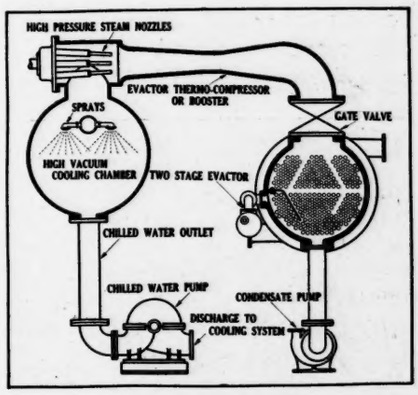
Croll-Reynolds Evactor

Croll-Reynolds Co., Inc., 17 John St., New York, some time ago placed on the market the Evactor, a steam jet refrigerating system.

The Evactor consists of a thermal compressor, a high vacuum cooling chamber, a condenser, and accessory parts. Steam is supplied to the thermal compressor. The flow of the steam through the compressor builds up a vacuum in the cooling chamber so that the water contained there boils at a low temperature. The vapor passes through the compressor and the cooled water remaining is circulated to the heat exchange surface used in connection with refrigerating or air conditioning.

After passing through the thermal compressor, the steam is condensed in a surface condenser.

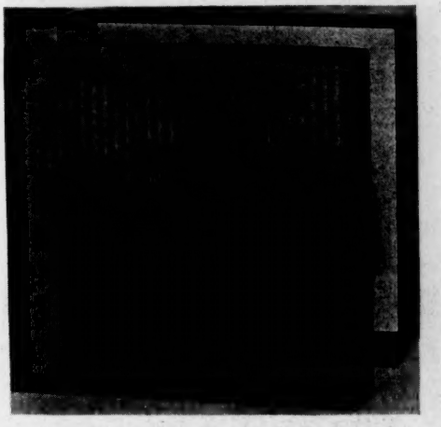
Many variations in the apparatus may be made to meet individual conditions. Two or more Thermo-Compressors may be used in parallel to permit maximum efficiency and flexibility in handling varying loads. A surface condenser may be substituted in place of the barometric condenser shown where operating conditions or location make it desirable. Also an Evactor having a surface intercooler and after-condenser may be used or a steam or motor-driven reciprocating vacuum pump. The number and arrangement of cooled water pumps, condensate pumps, injection or circulating water pumps depend on economical and operating conditions and must be worked out for each particular installation. These and other considerations make it impractical to offer completely standardized systems. Evactor systems are assembled largely from standardized parts manufactured in the company's shops.



Typical arrangement of Evactor with surface condenser

American Airmat Drifilter

American Air Filter Co., Inc., Louisville, Ky., has introduced a new type of renewable or throw-away filter called the Airmat Drifilter for which is claimed the same high efficiency as standard Airmat filters with the added advantage of low first cost and inexpensive maintenance.



Type K American Airmat Drifilter

Drifilter element, or cell, is made of a continuous sheet of 6-ply Airmat filtering material folded back and forth over corrugated spacers and securely encased in a heavy cardboard channel section. This construction makes it possible to obtain approximately 30 sq. ft. of filtering area in a single unit 20 in. square by 4 in. deep. After the cell has accumulated its full dust load, it is discarded and replaced with a clean cell.

The unit consists of a filter element and a permanent metal frame. The frame is provided with clips for holding the filter cell in place and arranged for bolting adjacent frames together to form an installation of any desired capacity. Each unit is rated at 600 to 800 c.f.m., depending upon the amount of dust in the air. The initial resistance at 600

c.f.m. is 0.10 in. and at 800 c.f.m., 0.185 in. w.g. The shipping weight for a complete unit is 22 lb., and for a Drifilter cell 6 lb.

Metal-Covered Sound Insulation for Ductwork

A silencing treatment for air ducts, consisting of perforated metal backed by sound-absorbing acoustical material, has been developed by the Burgess Battery Co., 111 West Monroe St., Chicago. The manufacturer states that this type of sound insulation effectively absorbs blower and air rushing noises in ducts without affecting the volume of air flow.

Perforations in the metal covering, although having a small aggregate area, allow the sound waves propagated in the air stream to penetrate freely into the absorbing material, which dampens the pressure pulsations and renders the disturbance inaudible. The metal surface provides a frictionless passage for the air and retains the absorbing material in place, preventing high velocity air from carrying it away.

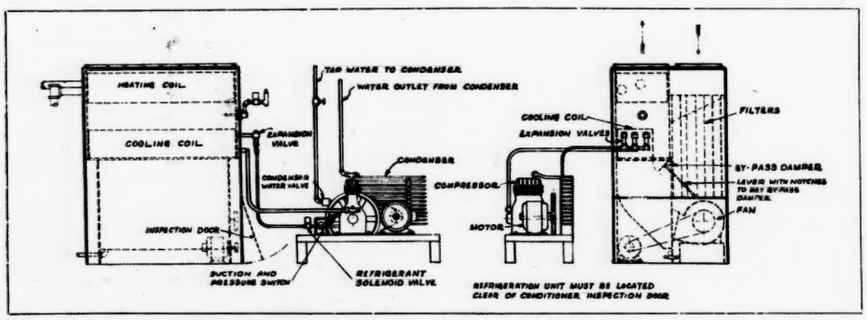
Electrol-American Air Conditioner

The Electrol-American air conditioner was shown publicly for the first time at the recent Oil Burner Show in Philadelphia. The conditioner is built by the American Blower Corporation for Electrol Incorporated.

This conditioner is made in two types and four sizes, with capacities making it available for installations ranging from homes to small commercial jobs. The series H conditioner was designed primarily for winter air conditioning and provides heating, humidification, cleaning, and circulation.

Series CH models are identical in appearance and construction with those of Series H, but contain, in addition, a refrigerating coil and a patented damper arrangement which permit both a definite cooling and dehumidifying of the air in the summer.

Series H is available in four sizes, with heating capacities ranging from 107,000 to 312,000 B.t.u. per hr. gross output, based on 2-lb. steam pressure. Series CH, available with four sizes of refrigerating machines, have cooling capacities from 24,850 to 62,100 B.t.u. per hr., with condenser water requirements of 2.69 to 6.73 g.p.m.



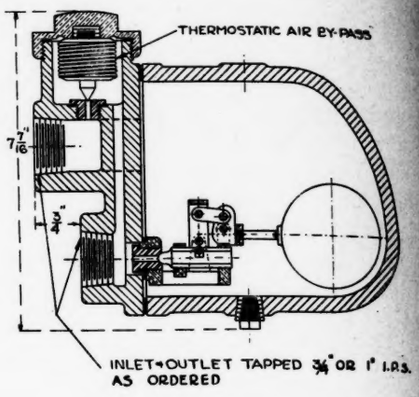
Electrol-American air conditioner, Series CH.

Sarco Combination Float-Thermostatic Trap

An addition has been made to the line of steam traps manufactured by Sarco Company, Inc., 183 Madison Ave., New York. The device is a combination float thermostatic trap, Type FTO-H, and has working pressures to 180 lb. per sq. in.

The trap is compact in design and light in weight and can be supported directly on the piping. Inlet and outlet are on the same side, a small vertical distance apart for easy connection to horizontal pipes. All working parts are on the cover and can be exposed for cleaning by removing the trap body, without disturbing the connections.

The automatic air by-pass is arranged on the down-board side of the trap so that the thermostatic element is not exposed to the full steam pressure. It will keep the trap vented at all times so that it cannot become air-bound. The main discharge valve and seat are of stainless steel for long life and freedom from scoring.



Sarco Type FTO-H trap

Available with three different sized seats, capacities range from 1900 to 2100 lb. of water per hour.

Burner-Fired Range

Bramhall, Deane & Co., New York, range manufacturers, in conjunction with Electric Furnace-Man, Inc., 7 Dey St., New York, has introduced the first restaurant range designed throughout for firing with an automatic anthracite burner. Stokers have been used to a considerable extent in the past in connection with ranges, but such jobs have been conversion installations. The new E.F.-M. unit, of steel, designated as a 6-ft. range, operates with greater efficiency than conversion jobs, and is well insulated throughout with insulation backed by heavy boiler plate.

The burner is the Electric Furnace-Man Type JR, with the exception of the hopper which was designed especially for this unit so that the top will line up with the top of the range. This allows a 2-sq. ft. work table on the end of the range, fitting over the top of the hopper. The burner can be installed at either the right or left end of the range. The burner uses rice anthracite, and the hopper will hold 100 lb. of this fuel.

JOHN BAKEWELL and ARTHUR BROWN, JR.

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On this page are examples of pipe selection ased on service records (we call it "Pipe Pre- cription") as practiced by John Bakewell and Arthur Brown, Jr., of San Francisco. Note the services for which wrought iron is specified.

If you wish to review specifications used by many of the country's leading architects and the comparative service records which guided them in the selection of wrought iron, just ask a Byers Engineer or write our Engineering Service Department. A. M. Byers Company, Established 1864. Pittsburgh, Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Los Angeles.

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